Agricultural dynamics and food security trends in Nigeria

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General introduction to the four DRA/ASC-AFCA Research Reports

From 'Tracking Development' to 'Developmental Regimes in Africa' and 'Agro-Food Clusters in Africa': further research questions

Between 2007 and 2012 the Netherlands Ministry of Foreign Affairs funded a research project to compare the long-term developments in Southeast Asia and Sub-Saharan Africa. Long-term meant: with a focus on the second half of the 20th century. The main research question was: how could countries, which were all having low levels of socio-economic performance in the 1950s, differ so much in economic performance in the following decades? The research team consisted of researchers from the Royal Netherlands Institute of Southeast Asian and Caribbean Studies (KITLV) and the African Studies Centre, both in Leiden, together with senior and PhD researchers in four Southeast Asian and four African countries, which were compared one-to-one: Nigeria with Indonesia, Uganda with Cambodia, Kenya with Malaysia and Tanzania with Vietnam.[1] One of the main conclusions drawn by project leaders David Henley (KITLV) and Jan Kees van Donge (ASC) was that the economic breakthrough in Southeast Asia can only be well understood if one looks at the massive state-led rural development campaigns from the 1960s onwards, which resulted in a major agricultural revolution and in generally successful rural poverty alleviation on a mass scale. This was much less so in Africa, where many political leaders in post-colonial governments have made different choices, neglecting the rural peasants and trying to implement an elite-based industrialization strategy that had disappointing results (Henley & van Donge 2012; Vlasblom 2013).[2] The DfID-funded Africa Power and Politics Project (APPP) came to a comparable conclusion, focusing on Africa's ruling elites: these elites exploited or ignored the rural masses and can be held responsible for economic stagnation and rampant poverty and hunger. The important scientific and policy question can then be asked: if Africa would put more emphasis now on its agricultural sector (like Southeast Asia did from the 1960s onwards), would it be possible to repeat the 'growth miracle' and combine an agriculture-based rapid growth strategy, with a successful poverty alleviation strategy, particularly in the rural areas?

Although these main conclusions were shared by most participants in the Tracking Development team, there is quite some controversy about the causal factors, and about more recent trends. Based on statistical evidence from FAO sources (FAOSTAT), four DRA/ASC-AFCA Research Reports deal with these dynamics and with recent trends and show that a) not all was gloomy in Africa's agricultural performance between 1960 and 2000, and that b) from about 2000 onwards major breakthroughs can be seen, suggesting that Africa's agricultural

[1] Results of the Tracking Development project can be found in Berendsen, B., T. Dietz, H. Schulte Nordholt & R. van der Veen (2013), *Asian Tigers, African Lions. Comparing the Development Performance of Southeast Asia and Africa*. African Dynamics, Vol.12 Leiden: Brill. The chapter most relevant to this working paper series is Dietz T. (2013), Comparing the agricultural performance of Africa and Southeast Asia over the last fifty years: pp. 85-128, and for this working paper on Uganda: Leliveld, A. & H. ten Brummelhuis (2013) Agricultural policies and performance in an African and Asian poor agrarian society: Uganda and Cambodia compared: pp. 419-452.

[2] Henley, D. & J.K. van Donge (2012), Policy for development in Africa: Learning from Southeast Asia. London Developmental Regimes in Africa Policy Brief 01; Vlasblom, D. (2013), *The richer harvest. Economic development in Africa and Southeast Asia compared*. Leiden: African Studies Centre.

sector *is* improving, or even that Africa is already experiencing an 'agricultural revolution', although a different one than Southeast Asia's "Green Revolution". The Research Reports focus on the four African case-study countries in the Tracking Development project: Nigeria, Uganda, Kenya and Tanzania. For each country four types of analysis are presented: (1) agricultural production trends in the 1960-2011 period, (2) food balance trends during this period, combining these agricultural food production data with data on trade and consumption, (3) high-growth agricultural products in the 2000-2010 period ('agricultural islands of effectiveness'), and (4) data on food security, based on child undernutrition surveys, and (if available) trends. The Research Reports also include some relevant maps made available by the Centre for World Food Studies in Amsterdam. For each country, the Research Report ends with suggestions for a follow-up research agenda and with a first inventory of useful sources, made by the ASC's library and documentation unit.

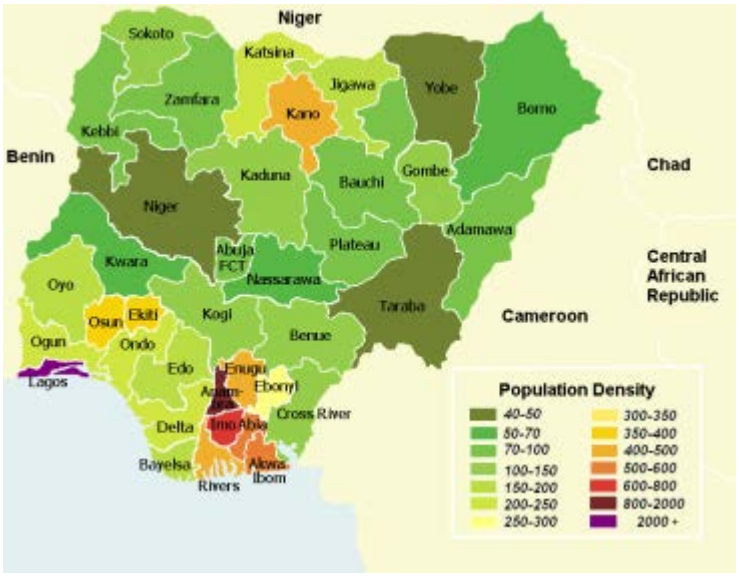
These four DRA/ASC-AFCA Research Reports are the first results of a Collaborative Research Group at the African Studies Centre in Leiden dealing with Agro-Food Clusters in Africa. Other studies will follow, both about these four countries and about other African countries. The research group intends to study four types of 'drivers of agricultural innovation breakthroughs and blockages': (i) urbanization and urban demand development for agricultural produce from relevant hinterlands; (ii) demand from elsewhere (for food, biofuels, and other export crops); (iii) business development and institutional arrangements in relevant value chains; and (iv) agricultural and rural development policies and practices. In the Tracking Development and APPP groups, the latter 'driver' received a lot of attention. In the ASC-AFCA team we tend to give due emphasis to the first driver of agricultural breakthroughs, which are currently happening all over Africa. We hope to be able to form research teams for particular agricultural products to do a detailed and, if possible, comparative (intra-African) analysis to determine the relative strengths of each of these four drivers of change for each of the 'agricultural islands of effectiveness' in the four countries and elsewhere in Africa.

One methodological remark should be made beforehand. Although FAO puts a lot of effort in its statistical data base, many researchers doubt the accuracy of these data. Some researchers even state that these data should not be used, and certainly not if one wants to compare countries. While acknowledging these caveats, in the Tracking Development project and in this DRA/ASC-AFCA follow-up research (as well as in the broader ASC-AFCA project) we are convinced that the FAOSTAT data collected over the past 50 years represent a unique statistical resource and deserves to be explored and exploited as a *starting point* and possible background canvas for any discussion about food security trends in the case study countries. However: it should be triangulated with other sources and treated with caution.

1. Nigeria's agricultural dynamics, 1961-2011

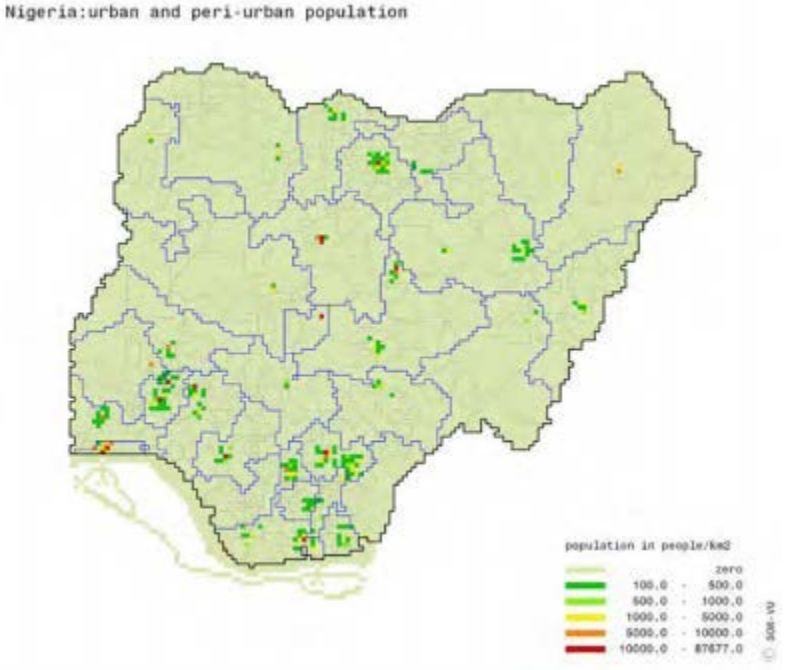
Nigeria is one of Africa's demographic and economic giants. With currently more than 160 million inhabitants one in every seven African consumers is a Nigerian. Figures 1 and 2 show population densities and urban concentrations.

Figure 1: Nigeria's states and population density



Source: http://en.wikipedia.org/wiki/File:Population_density_map_of_Nigerian_states_-_English.png

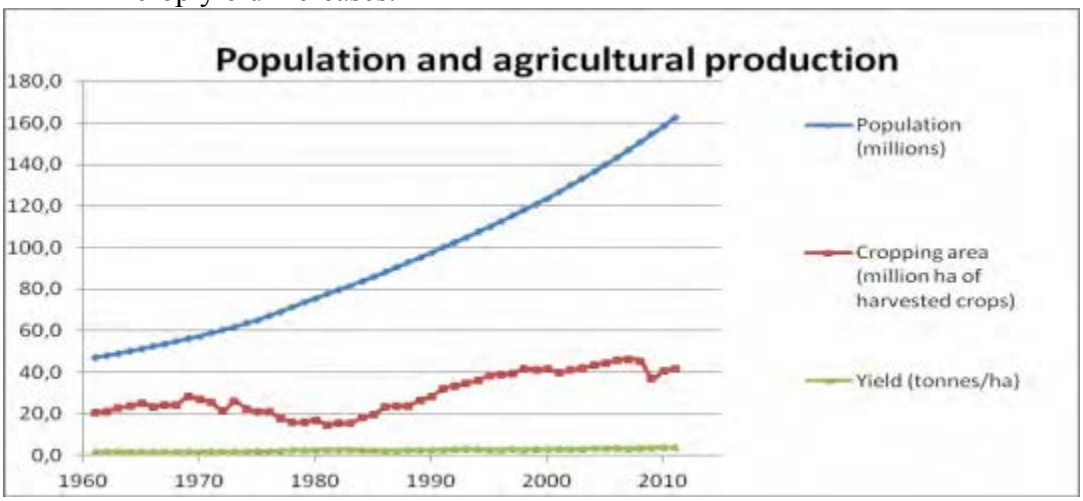
Figure 2: Nigeria: urban concentrations



Source: Van Wesenbeeck, C.F.A. & M.D. Merbis (2012), *Africa in Maps. Data repository of the food economy in Sub-Saharan Africa*. Amsterdam: Centre for World Food Studies ('zero' = <100/km2; rural)

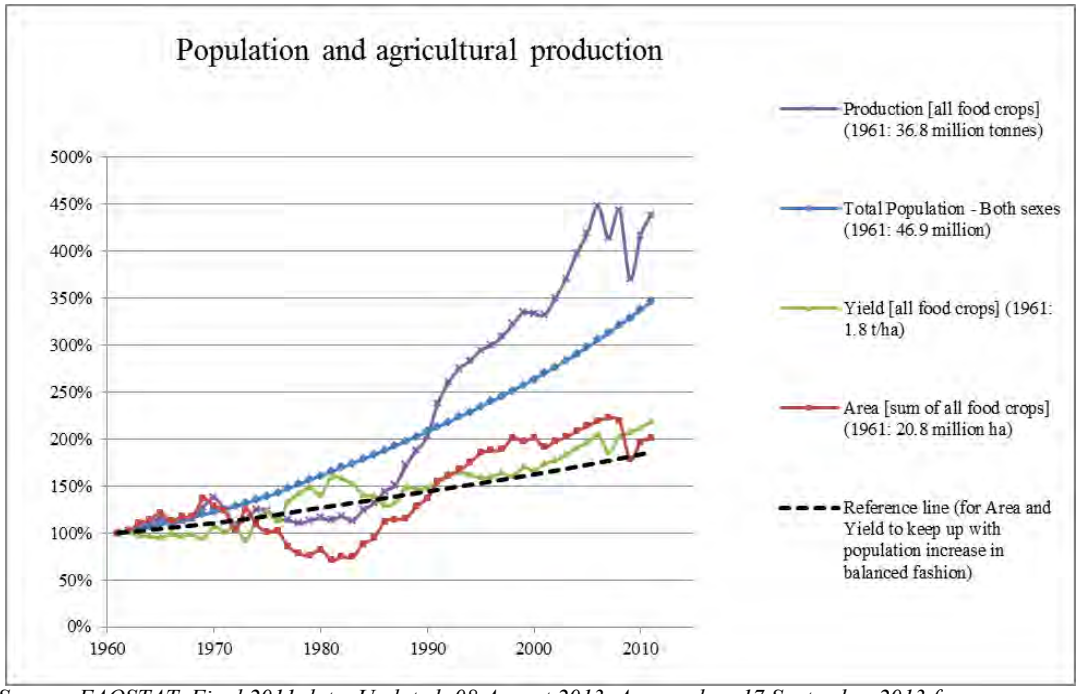
Nigeria experienced high population growth (increase by a factor of 3.5 during the period 1961 to 2011: see Figures 3 and 4). Nigeria is often portrayed as a country that completely neglected its agricultural sector after the oil bonanza started during the 1960s. Indeed, Nigeria's agricultural production stagnated up to 1983, but it shows a boost since 1984. Agricultural growth kept more than pace with population growth since 1990. Both crop area expansion and yield increases played a role. The food gap diminished (for cereals, roots & tubers, and non-staple foods) and dietary variety increased, especially for oil crops and sugar.

Figure 3: Nigeria 1961-2011: population figures, growth in cropping area and crop yield increases.



Source: FAOSTAT, Final 2011 data, Updated: 08 August 2013, Accessed on 17 September 2013 from http://faostat.fao.org/site/567/default.aspx#ancor

Figure 4: Nigeria 1961-2011: population and food crop growth indexes with 1961 as a baseline.



Source: FAOSTAT, Final 2011 data, Updated: 08 August 2013, Accessed on 17 September 2013 from http://faostat.fao.org/site/567/default.aspx#ancor

According to WHO norms, Nigeria's basic food production was potentially just marginally sufficient at independence in 1960 if all produced food would reach the Nigerian consumers and if that would happen with a fair distribution (see Table 1: 749,000 kilocalories/capita/year; or 2050 kcal/day; WHO norms for a healthy life depend on various factors like the age and gender composition of the population, climate and work conditions; 2000-2250 kcal/day can be regarded as sufficient in a population with relatively many young children).

Table 1: Population and basic food production dynamics in Nigeria, 1961-2011

	1961	1970	1980	1990	2000	2011	2011/1961 index
Population (millions)[1]	47	57	76	98	124	163	346
Cropping area (ha of harvested crops x million)							
Cereals	10.6	12.4	7.2	15.4	18.2	16.6	157
Pulses	1.3	3.9	1.6	1.9	3.7	3.3	254
Roots/tubers[2]	1.4	2.4	1.8	3.1	7.6	8.4	592
Yield (kg/ha x 1000)							
Cereals	0.7	0.7	1.1	1.1	1.2	1.3	179
Pulses	0.4	0.2	0.4	0.7	0.6	0.6	160
Roots/tubers	8.6	9.8	9.6	10.9	8.6	11.5	135
Total basic food production (million tons)							
Cereals	7.9	9.0	7.8	17.7	21.4	22.2	281
Pulses	0.5	0.9	0.6	1.4	2.2	1.9	406
Roots/tubers	12.2	23.8	17.1	33.6	65.2	97.2	797
Food energy value of crop mix (kcal/kg) [recalculated from FAOSTAT]							
Cereals	2969	2983	3012	3123	3051	3069	103
Pulses	3278	3309	3253	3331	3352	3360	103
Roots/tubers	833	872	827	847	858	895	107
Weighed total[3]	1709	1502	1549	1677	1449	1331	78
Potential food energy value (kcal/capita/year x 1000)							
Cereals	499	467	311	566	527	419	84
Pulses	33	54	24	48	61	40	120
Roots/tubers	217	361	187	292	452	535	247
Total	*749*	*882*	*522*	*906*	*1040*	*994*	*133*
Potential food energy value (kcal/capita/day)							
Cereals	1367	1279	850	1550	1443	1146	84
Pulses	90	147	66	132	166	109	120
Roots/tubers	593	988	512	799	1237	1465	247
Total	*2051*	*2412*	*1429*	*2480*	*2846*	*2720*	*133*

[1] Population data and standard food composition from FAOSTAT Population and Food Balance Sheets. All crop data: FAOstat crops final 2011 data, Updated: 08 August 2013, Accessed on 17 September 2013 from http://faostat.fao.org/site/567/default.aspx#ancor.

[2] Roots and tubers in Nigeria are mainly cassava and yams but also cocoyam, sweet potatoes and minor roots and tubers. Plantains in Nigeria also add calories (in both 1961 and in 2011 almost 15,000 kcal/cap/yr) to the basic diet.

3 A decrease in the weighed total energy content of the basic food production reflects an increase in the relative contribution of the items having a high water content, i.c. the roots & tubers.

In the ten years following independence, Nigeria's food situation continued to improve: all basic food products expanded, although mainly in area and not so much in yield. Based on caloric values the growth of root and tuber production (mainly cassava and yams) was so impressive that it overtook cereals as the most important type of basic food produced in this period. In the 1970s, the picture changed completely. There was a dramatic decrease in the areas harvested for all types of food crops and although yields improved for cereals (and recovered for pulses), production levels were much lower than in the 1960s, which resulted in an average food energy value per capita of almost 30% below minimum WHO requirements. However, a major recovery took place during the 1980s, with all types of food crops expanding by area harvested (with many more than doubling in area) and yields also improved somewhat. Potential food sufficiency improved so significantly that, at the start of the 1990s, Nigeria had reached the high potential food sufficiency figures it enjoyed in 1970, even in the context of a fast growing population as will be shown shortly. During the 1990s, the harvested areas further increased, with the area of roots and tubers more than doubling, although yield levels began to stagnate (for cereals) or even decreased (for pulses and roots and tubers). The area expansion was so important that overall production levels improved even more during this period and Nigeria reached a level of potential food sufficiency that was 42% higher than WHO minimum requirements, if we use 2000 kcal/day as a minimum. Over the last ten years (2000-2011), total food production levels per capita went somewhat down. For cereals and pulses, the harvested areas contracted considerably but yields improved a bit and as a result, total cereal production stabilized. For roots and tubers, the harvested area increased and also yields improved so roots and tubers reached an all-time high production level. Due to the ever-growing Nigerian population, the average available energy values went down but to a level that is potentially still more than sufficient for an average healthy life.

Looking at the 1961-2011 period as a whole, Nigeria's population increased by a factor of 3.5; but its total food production increased by a factor of 8.0 for roots and tubers and a factor of 3.8 for pulses. Total cereals increased by a factor of 2.8, which is lower than the population growth rate. As a result, food composition in Nigeria changed from 67% cereals and 29% roots and tubers in 1961 to 42% cereals and 54% roots and tubers in 2011 (based on the dietary energy content of the basic production figures). A production increase can be partitioned in its two components as follows: the contribution of area is taken as the *increase* in area since 1961 multiplied by the yield in 1961 and the contribution of yield as the area in 1961 multiplied by the *increase* in yield since 1961). The percentage contribution is obtained by expressing each component as a percentage of their sum. Thus, total cereal production increases in Nigeria between 1961 and 2011 can be attributed for 58% to increases in yield and for 42% to an expansion of the area under cultivation. For pulses, the figures are 28% and 72% respectively and for roots and tubers almost all production growth (93%) can be attributed to area expansion, and only 7% to yield improvements.

Surprisingly, the improvements in Nigeria's cereal production over the last fifty years were more driven by yield improvements than by area expansion. Nigeria's areas of cereal cultivation increased by a factor of 1.6 between 1961 and 2011. Nigeria's cereal yields improved by a factor 1.8. But Nigeria came from very low average yield levels: only 700 kg/ha cereal yields in 1961. Nigeria had almost doubled this level in 2011, but compared to many other parts of the world this is still low. The harvested area of roots and tubers increased

dramatically but crop productivity much less so. Between 1961 and 2011, average yields for roots and tubers in Nigeria increased from 8,600 kg/ha to 11,500 kg/ha. As a result of a massive area expansion of cassava and other roots and tubers, Nigeria's basic food production profile shifted in the direction of roots and tubers, and is now dominated by these food types. This major shift can also be seen by comparing the various crop statistics in more detail (Table 2). If we look at the most impressive figures for expanding crop areas, potatoes and sweet potatoes lead, followed by rice, yam, cassava and maize, while the areas of 'northern cereal crops' (millet and sorghum) declined or stagnated. And if we look at food crop production figures, the growth of potato volume tops the list, followed by rice, sweet potatoes, yam, maize, cocoyam and cassava.

Table 2: Nigeria: more detailed food crop statistics, for basic food crops with at least 250,000 t production in 2011: comparison 1961 and 2011*

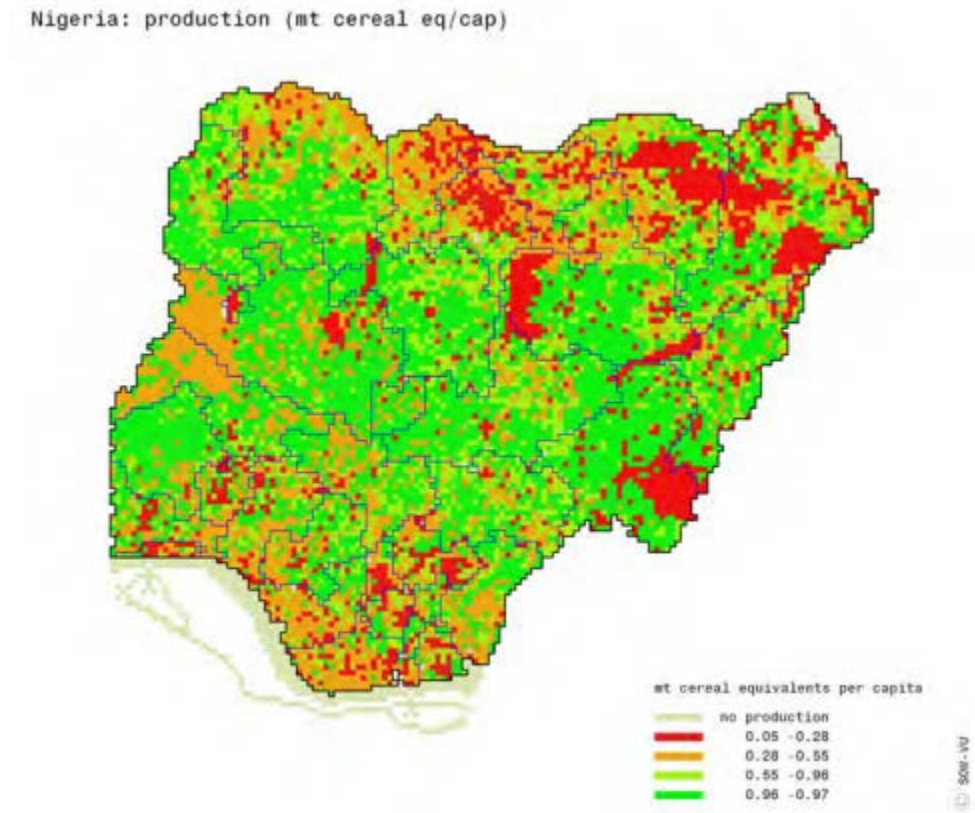
Crop	Harvested area (x 1000 ha)			Yield (kg/ha)			Production (x m kg)		
	1961	2011	2011/ 1961 index	1961	2011	2011/ 1961 index	1961	2011	2011/ 1961 index
Cassava	780	3737	479	9467	14023	148	7384	52403	710
Yam	450	2889	642	7778	12847	165	3500	37116	1060
Maize	1375	6008	437	805	1528	190	1107	9180	829
Sorghum	4658	4891	105	850	1410	166	3958	6897	174
Rice	149	2580	1731	893	1771	198	133	4567	3434
Sweet potatoes	13	1100	8462	11462	3000	26	149	3300	2215
Cocoyam	181	455	252	6337	7173	113	1147	3266	285
Plantains	200	450	225	3990	6000	150	798	2700	338
Cow peas	1216	3190	262	354	583	165	431	1861	432
Millet	4360	2889	66	606	440	73	2644	1271	48
Potatoes	2	260	13,000	9000	4231	47	18	1100	6111
Other cereals (fonio, wheat)	79	259	328	620	965	156	49	250	510

* In **bold** basic food crops with production growth faster than population growth for the fifty-year period as a whole.

The relative importance of basic food crops in Nigeria as a percentage of all crop land use was and remained at a level of 60-65%. In 1961, the total crop area in Nigeria started as a much higher percentage of total land area than in most other countries in Africa: at 23%. In 2009, 42% of Nigeria's total land area (910,771 km²) was under agricultural production. Over the last ten years, crop area expansion for non-basic food crops was impressive while crop area figures for cereals and pulses went down compared to ten years ago and roots and tubers stagnated. In the fifty years following independence, crop expansion was most visible in tree nuts, sugarcane, and roots and tubers (see Table 3). Looking at the crop area figures as a whole, oil crops were and still remain the dominant non-basic food crops, with oil palm mainly coming from the south and groundnuts from the north of the country. But within oil crops, the area and production expansion for soy and karité nuts (shea nuts) is much higher than for other oil crops.

The Amsterdam-based Centre for World Food Studies has produced a few detailed maps that give some insight into the geographical differences in Nigeria's food production (Figure 5) and the food surplus areas (Figure 6).

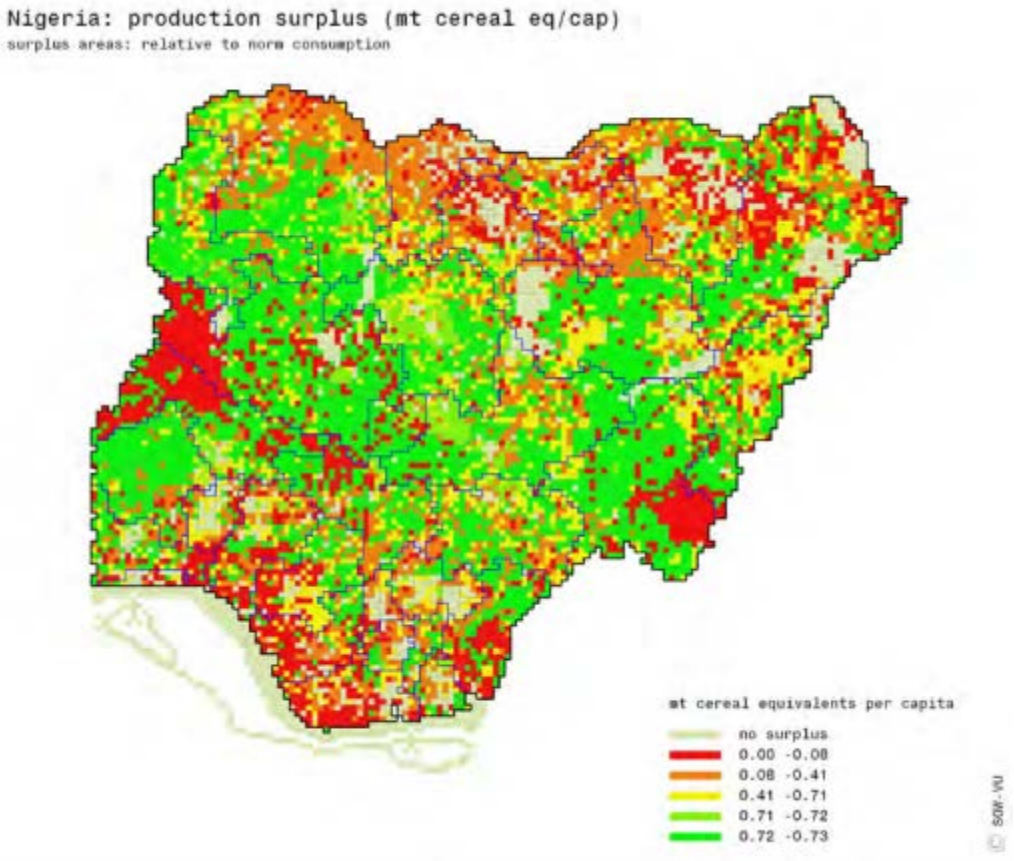
Figure 5: Nigeria's food production (ca 2005)



Source: Van Wesenbeeck, C.F.A. & M.D. Merbis (2012), *Africa in Maps. Data repository of the food economy in Sub-Saharan Africa*. Amsterdam: Centre for World Food Studies

Nigeria has also experienced an increase in livestock figures and, despite its high population growth, its livestock numbers are growing even faster, with the exception of cattle (although growth here is also impressive). Livestock growth figures in Nigeria (as measured in tropical livestock numbers) were particularly high in the 1960s and 1970s (see Table 4), since when they closely follow population growth trends. Nigeria's economic boom coincided with a major increase in the country's livestock wealth. Livestock investments are particularly visible in the expansion of so-called small stock (goats and sheep) and pigs. With a per capita growth index of 155, Nigeria must have been one of the most successful livestock expansion countries in Africa.

Figure 6: Nigeria's food surplus areas, ca 2010.



Source: See figure 5.

Table 3: Nigeria's crops: harvested area (x 1000 ha), 1961-2009

Crop	1961	2011	2009/1961 index	Highest in
Cereals	10600	16600	157	2007
Pulses	1300	3300	254	1998
Roots/tubers	1400	8400	592	2007
Fibres	300	260	87	2006
Oil crops	5200	7600	146	2005
Plantains	200	450	225	2007
Fruits excl. plantains	550	1390	251	2004
Tree nuts	15	370	2452	2011
Vegetables	580	1870	321	2011
Spices	21	88	417	2006
Masticatory nuts	155	230	148	2010
Cocoa	700	1270	181	2007
Coffee	6	2	35	1985
Sugarcane	7	74	1057	2011
Tea	-	-	-	-
Tobacco	19	18	92	1971
Total	*21125*	*41995*	*199*	*2007*
Basic food/Total	*63%*	*68%*		

Table 4a: Nigeria's livestock (x million), 1961-2011

Year	1961	1970	1980	1990	2000	2011	2009/1961 index
Cattle	6.0	8.9	12.1	13.9	15.1	18.9	315
Sheep	1.0	3.2	8.1	12.5	26.0	38.0	3730
Goats	0.6	3.2	11.3	23.3	42.5	57.3	9200
Pigs	0.6	0.8	1.0	3.4	5.0	7.7	1200
Total	*8.3*	*16.1*	*32.5*	*53.2*	*88.7*	*121.9*	*1470*
Chickens	37.0	52.0	80.0	126.0	113.0	202.0	540
*Total TLU**	*4.8*	*7.5*	*11.3*	*15.0*	*19.1*	*25.5*	*530*
TLU/capita	*0.103*	*0.130*	*0.150*	*0.153*	*0.154*	*0.157*	*155*

* TLU: cattle x 0.7; goats, sheep and pigs x 0.1; chickens x 0.01; Nigeria also has a few thousand camels: camels x 1.0.

Fisheries

The production statistics from inland fisheries in Nigeria show a fourfold increase by 1980, then stagnation, followed by a very strong increase in the past decade to reach a 20-fold level compared to 1961. The production from marine fisheries in Nigeria increased more gradually up to 2000 and did not increase much in the past decade, to reach a 10-fold level compared to 1961. While the population increased by a factor 3.5, the average amount of fish per capita has yet more than quadrupled since 1961 (see Table 4b).

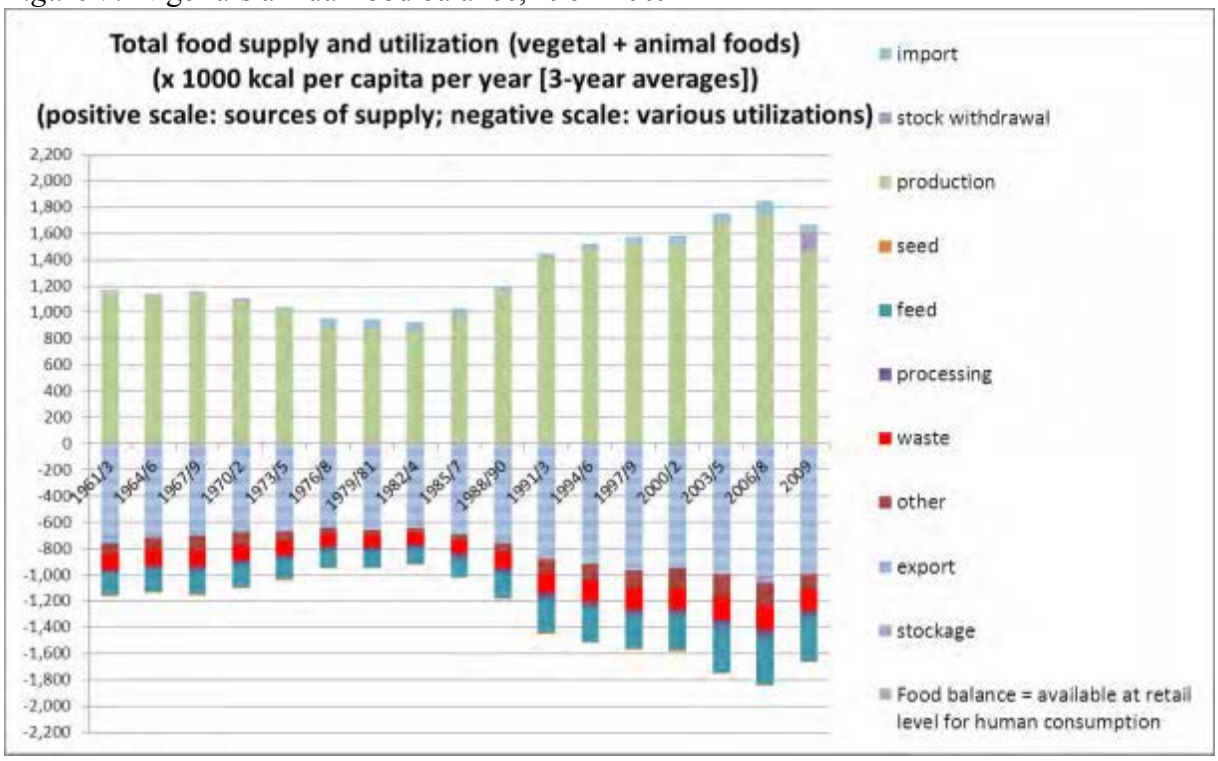
Table 4b: Nigeria's fisheries(x 1000 tonnes), 1961-2011

Year	1961	1970	1980	1990	2000	2011	2011/1961 index
Freshwater fishes	25.0	76.3	113.3	98.7	158.0	522.4	2090
Crustaceans	0.6	1.6	1.9	8.6	25.6	28.5	4750
Marine fishes	29.4	78.0	146.1	203.4	283.5	301.5	1025
Molluscs	-	-	-	5.6	-	4.2	
Total	55.0	155.9	261.3	316.3	467.1	856.6	1560
kg/capita	1.2	2.7	3.5	3.2	3.8	5.3	450

2. Nigeria's food balance 1961-2010

Food production is not the same as food consumption. A country can produce an adequate volume of food to feed its population, but still have a food deficit at household and individual level. Food production can be augmented by food imports and stock withdrawal, but farm production volumes can also be exported, or be used for seed, as livestock feed (in the country itself or exported), for industrial processing (and then eaten locally or exported), or stocked for later. A major part of a country's food production can also be wasted between farm gates and retail outlets (and at home; but the FAO food balance sheets do not measure that). All of this together gives the annual food balance: the food available for consumption at retail level(see the food balance in Figure 7 [first bar below the zero line, expressed in 1000 kcal per capita per year] and in Figure 8 [now in positive scale, expressed in kcal per capita per day]).

Figure 7: Nigeria's annual food balance, 1961-2009



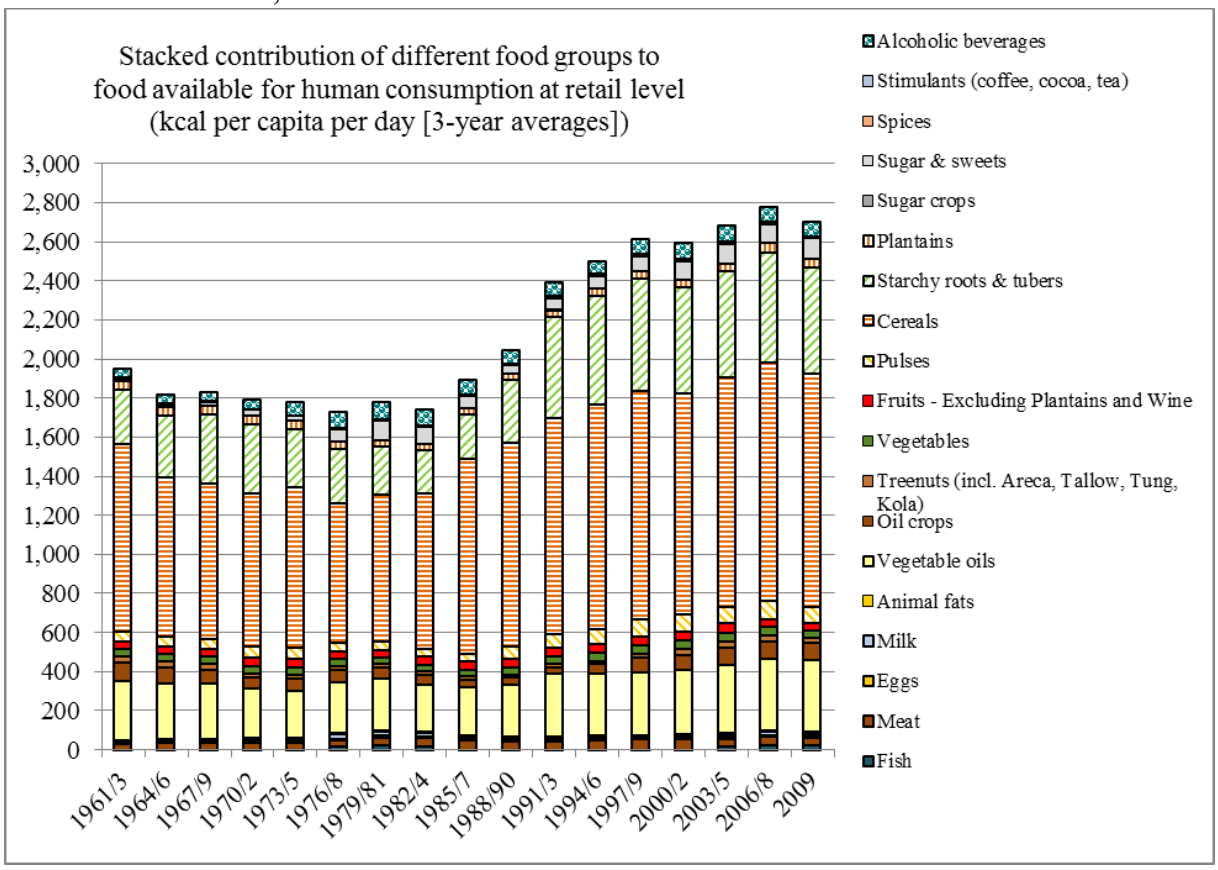
Note for reading the graph:

- The positive scale shows sources of food supply (production + withdrawal from stocks + import).
- The negative scale shows 7 'disappearances' into utilizations other than human consumption (putting into stocks + export + other + waste + processing + feed + seed).
- The amount remaining (shaded part: the 'food balance') is an indirect estimate of food available at retail level for human consumption.
- The disappearance factors are positive amounts, but in this graph they are represented on the negative scale, adding up (with the 'food balance') to exactly the same total as the food supply on the positive scale.
- Note: that the legend of the graph shows the utilizations in reverse order is due to a technical constraint in constructing this 'mirror imaged' stacked bargraph.

The production figures given here are based on all food crops (unlike the data in the former section of this document, where we concentrated our analysis on cereals, pulses and roots and tubers). The data in Figure 7 give the same overall picture, though: total food calories available at farm gates were more than sufficient (potentially) to feed Nigeria's population adequately around Independence (1960). But the situation gradually deteriorated to a much lower level in 1982/84, after which a recovery took place, going beyond the 1961/63 level in 1988/90 and reaching an all-time high in 2006/08. After that, there was a slight drop, but overall production levels per capita were still high. Food imports were very low in 1961 but gradually increased in the 1970s (fuelled by oil income), and had reached levels of 100,000 kcal/capita/year in the mid-2000s. Of total food crop production, only limited amounts have been used for seed and for food exports in Nigeria. However, a growing (and high) percentage of food production is used as feed for Nigeria's thriving livestock sector and for industrial processing and some export. And between 150,000 and 250,000 kcal/capita are wasted each year. As a result of all this, food available for direct household consumption (at retail levels) is much lower than food production figures suggest. Until the early 1990s, food availability data suggest that average food security was a problem and must have been so for many Nigerians. From 1990 onwards, food availability at retail level improved considerably and on

average Nigerian consumers can be regarded as potentially food secure. However, food distribution (geographically and socially) is very unequal and hence many Nigerians are not at all food secure yet.

Figure 8: Nigeria's food available for human consumption: composition of the food basket at retail level, 1961-2009



The composition of Nigeria's 'food basket' gradually shifted to include more 'quality foods': in Figure 8 these can be seen from 'fruits' downwards, and in Figure 9 it can be seen with more clarity. This also shows a gradual but consistent improvement of the (potential) food security situation, starting around 1990.

Figure 10 shows the basic food composition, and we see a remarkable difference between the roots and tubers data presented here and in Table 1. In terms of caloric production roots and tubers started to dominate in the past decade; but in terms of caloric consumption it is still much behind cereals (although from the early 1990s onwards total roots and tubers available for consumption started to increase). We have already seen that feed use of roots and tubers became very important, and that explains the findings.

One may say that Nigeria's first and second quintiles of the income brackets succeeded to have enough food, enough quality foods, and enough livestock-based food, partly on the basis of roots and tubers as livestock feed produced in the country itself. It is questionable, though, whether Nigeria's third, fourth and fifth income quintiles also benefited from Nigeria's agricultural revolution.

Figure 9: Dietary diversity: contribution of nutritious non-staple foods to the diet in Nigeria

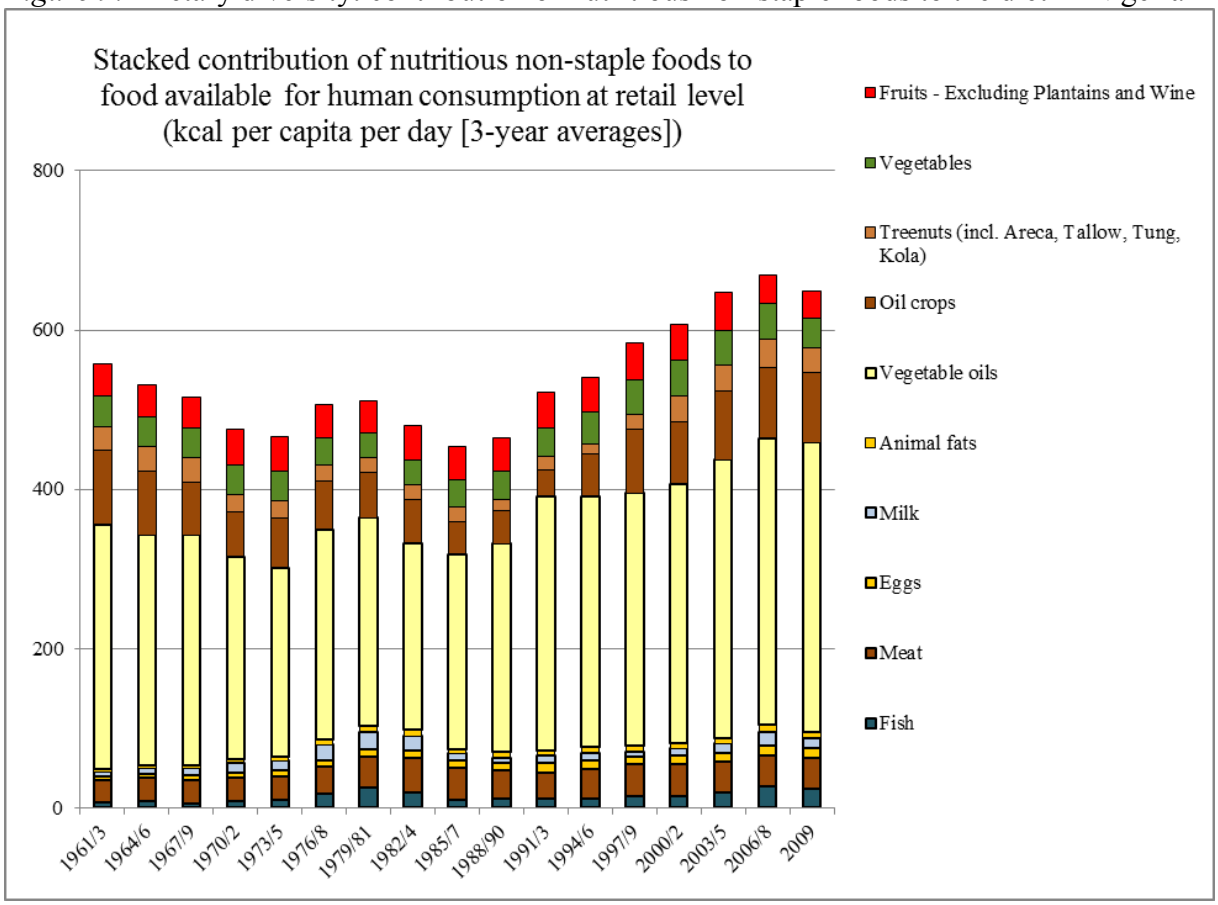
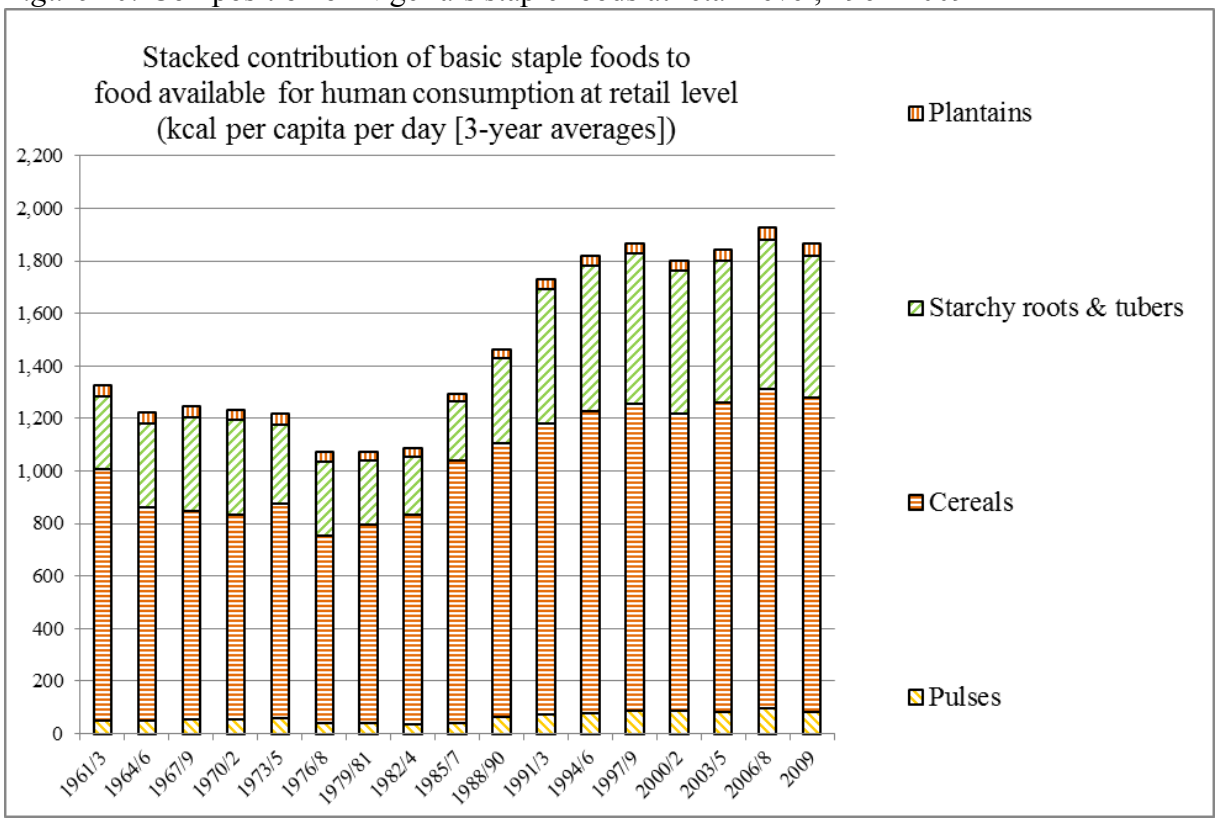


Figure 10: Composition of Nigeria's staple foods at retail level, 1961-2009



3. Nigeria's most successful agricultural products, 2000-2010

We have defined 'most successful crops' for Nigeria as crops with (a) more than 150,000 ha in 2010; (b) production growth between 2000 (= average 1999-2001) and 2010 (= average 2009-2011) that is above population growth for that period; and (c) yield increase of 20% or more during that decade. Successful livestock species are livestock species with numbers growing faster than population growth. For Nigeria, the most successful crops were maize, cassava, rice, melon seed, potatoes and pineapples. The most successful livestock species were chicken, pigs, sheep and goats. The production of milk and fish also kept more than pace with population growth. However, Nigeria also had crops in decline, i.e. with a decrease in absolute terms of both yield and production. These were millet, oil palm, cocoyam, and karité nuts. See Tables 5a and 5b.

Table 5a: Performance of Nigeria's major crops 2000-2010 (pop. growth 2000-2010: 28%)

Crop > 150,000 ha in 2010 (highest acreage first) Green: Promising crop Red: Problem crop	Ha in 2010 (x 1000)	Production [index number of 2010 compared to 2000] Green >128 Red <100	Yield [index number of 2010 compared to 2000] Green >128 Turquoise: >120<128 Red < 100	Area [index number of 2010 compared to 2000] Green >128 Turquoise: >120<128 Red < 100
Sorghum	4863	87	118	73
Maize	4503	171	130	137
Millet	3680	65	86	70
Cassava	3449	136	132	103
Oil palm	3200	99	96	104
Yams	2845	128	119	108
Cowpeas	2790	118	155	78
Groundnuts	2592	115	82	139
Rice	2283	135	129	105
Cocoa	1299	129	89	146
Sweet potatoes	1100	134	100	134
Citrus	788	116	110	106
Vegetables fresh nes	661	140	126	110
Taro (Cocoyam)	486	80	97	83
Melon seed	476	138	166	83
Plantain	450	138	120	114
Soybeans	391	100	140	76
Okra	388	145	108	135
Cashew	362	180	127	142
Rubber	345	134	124	108
Cotton	344	106	161	65
Karité nuts (Sheanuts)	343	89	60	149
Sesame	319	197	92	214
Tomatoes	269	141	91	148

Table 5a (continued): Performance of Nigeria's major crops 2000-2010 (pop. growth 2000-2010: 28%)

Crop > 150,000 ha in 2010 (highest acreage first) Green: Promising crop Red: Problem crop	Ha in 2010 (x 1000)	Production [index number of 2010 compared to 2000] Green >128 Red <100	Yield [index number of 2010 compared to 2000] Green >128 Turquoise: >120<128 Red < 100	Area [index number of 2010 compared to 2000] Green >128 Turquoise: >120<128 Red < 100
Kolanuts	257	186	65	284
Potatoes	257	181	148	122
Fruits, other.	181	75	149	50
Green maize	172	74	166	45
Pineapples	162	143	130	109
Onions, dry	159	215	63	346
Fonio	150	108	98	110

Source: FAOSTAT | © FAO Statistics Division 2013 - Updated: 08 August 2013, Accessed on 17 September 2013 (http://faostat.fao.org/site/567/)

Table 5b: Performance of Nigeria's major animals 2000-2010 (pop. growth 2000-2010: 28%)

Product/Type of animal Green: Promising species Red: Problem species	Number of animals producing or slaughtered in 2010 (x 1000)	Production [index number of 2010 compared to 2000] Green >128 Red <100	Offtake (% of animals producing or slaughtered out of total stock) [index number of 2010 compared to 2000] Green >128 Turquoise: >120<128 Red <100	Head count [index number of 2010 compared to 2000] Green >128 Turquoise: >120<128 Red < 100	Weight of milk/meat/eggs per animal [index number of 2010 compared to 2000] Green >128 Turquoise: >120<128 Red < 100
Cow's milk	2,097	132	117	113	100
Hen's eggs	156,000	147	93	159	99
Chicken meat	280,000	163	103	159	100
Goat	22,678	130	98	132	100
Sheep	14,876	141	101	140	100
Pigs	5,183	147	100	148	100
Cattle	2,630	115	104	113	98

NB. The index number of total production is the multiplication of the index for head count times the 2 indices for 'yield' (offtake and weight per animal)

Source: FAOSTAT | © FAO Statistics Division 2013 - Updated: 08 August 2013, Accessed on 19 September 2013 (http://faostat.fao.org/site/636)

Table 6: Nigeria's successful and less successful crops and livestock species, 2000-2010.*

Crops and livestock: yield increases 2000-2010		Production increases 2000-2010		
		<100%	100-120%	>128%
	>128% >120%	Fruits (other) Green maize	Cowpeas Soybeans Cotton	**Maize** **Cassava** **Rice** **Melon seed** **Potatoes** **Pineapples** **Fresh vegetables** **Cashew**
	100-120%	Sorghum	Citrus	Yams Sweet potatoes Plantain Okra Rubber Milk Chicken Goats Sheep Pigs Fish[1]
	< 100%	Millet Oil palm Taro (Coco-yam) Karité nuts (Sheanuts)	Groundnuts Fonio Cattle	Cocoa Sesame Tomatoes Kola nuts Onions Eggs

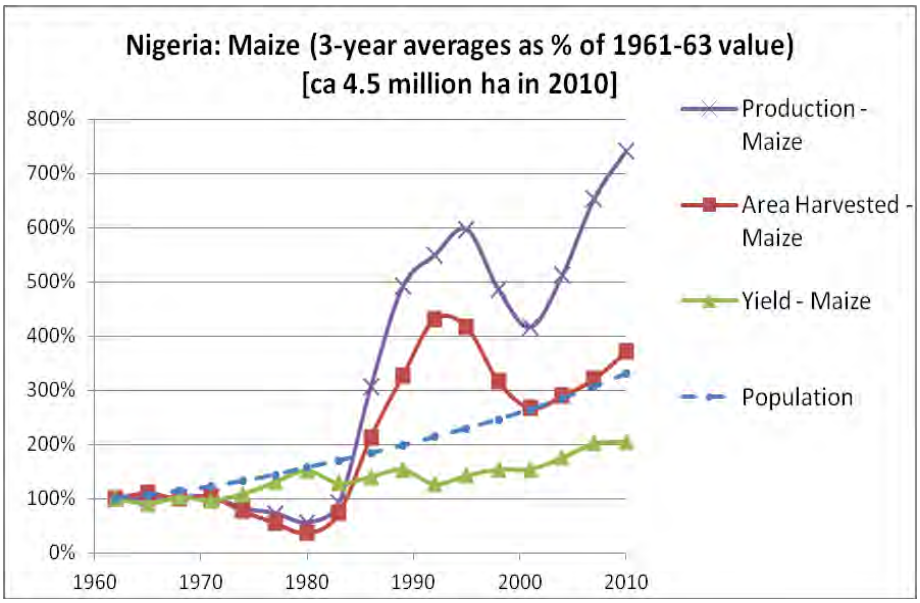
* In **bold**: promising crops and livestock species.

[1] For fish no information is available that can be taken as an index of 'yield'.

In the next section we present long-term dynamic data about the six 'most successful agricultural products', starting with the best performers. Please note that the area data for 2010 are averages for 2009-2011 while the data in Table 2 are for 2011.

Maize is an example of a very successful crop, and one that has become very important as a staple crop. Figure 11a shows the production performance for maize from 1961 onwards. During the 1960s, maize production stagnated and was slightly below population growth. During the 1970s, maize yields started to improve, but the harvested area of maize declined dramatically, resulting in a diminishing overall maize production per capita. From about 1980 onwards, harvested areas started to increase, and with stabilized yield levels total production of maize grew much faster than Nigeria's population. The mid-1970s and early 1980s were the years of 'Operation Feed the Nation' and the start of Green Revolution programmes respectively. However, in the 1990s, the harvested areas decreased considerably, although yield levels slowly increased. As a result, per capita maize availability decreased. Then a major improvement started. From 2000 onwards, maize clearly is a very successful crop with cropping areas easily keeping pace with population growth and steady improvements in yield levels resulting in considerable growth in maize availability per capita.

Figure 11a: Maize as a recently successful crop in Nigeria; performance data 1961-2011



The data for cassava, rice, melon seed, potatoes and pineapples speak for themselves (Figures 11b-11f). In the livestock sector we selected poultry as the most successful agricultural product, and its related production of chicken meat and hen's eggs (Figures 11-g1 and 11-g2).

Figure 11b: Cassava as a recently successful crop in Nigeria; performance data 1961-2011

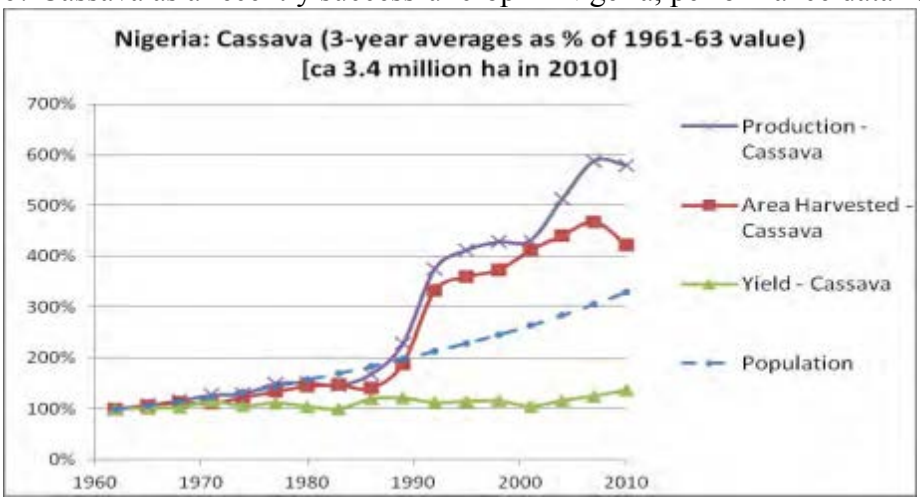


Figure 11c: Rice as a recently successful crop in Nigeria; performance data 1961-2011

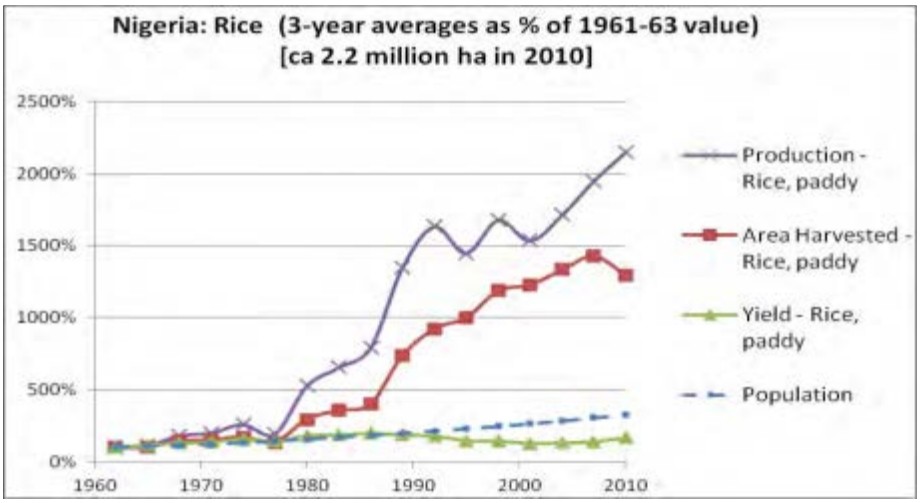


Figure 11d: Melon seed as a recently successful crop in Nigeria; performance data 1961-2011

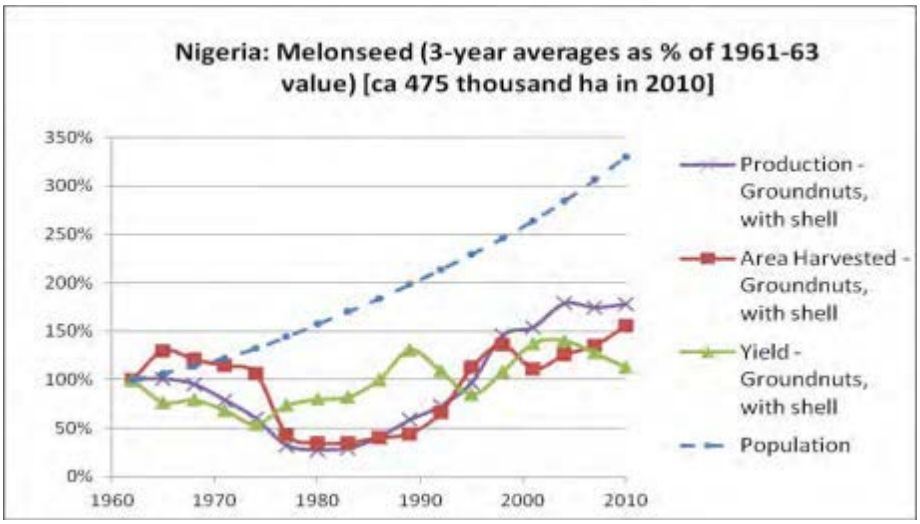


Figure 11e: Pineapples as a recently successful crop in Nigeria; performance data 1961-2011

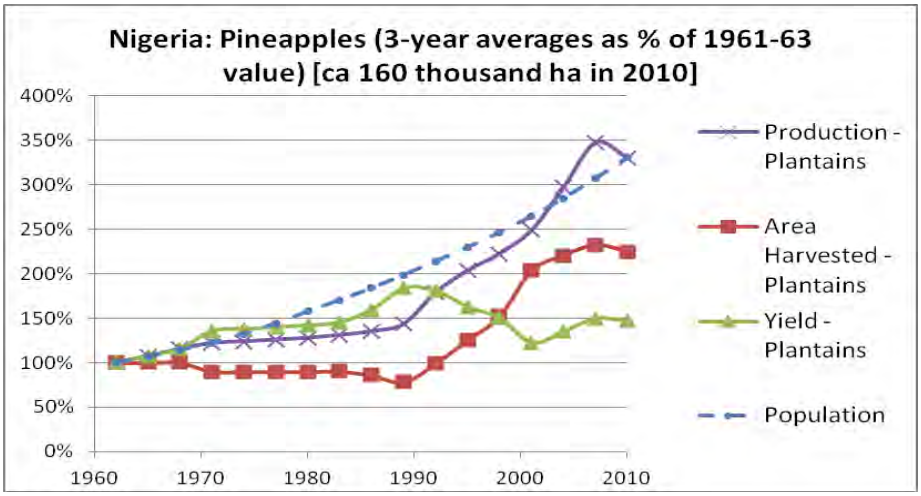


Figure 11f-1: Potatoes as a recently successful crop in Nigeria; performance data 1961-2011

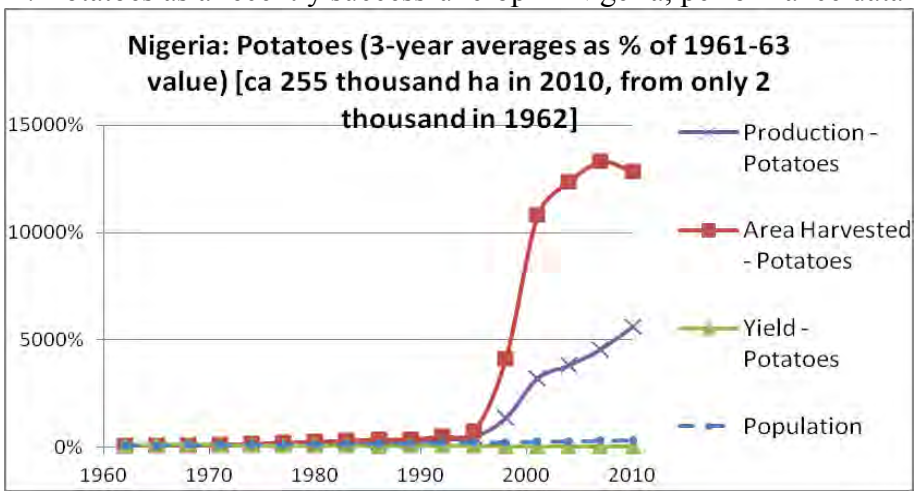


Figure 11f-2: Potatoes as a recently successful crop in Nigeria; performance data 1961-2011 [Detail: yield and population only]

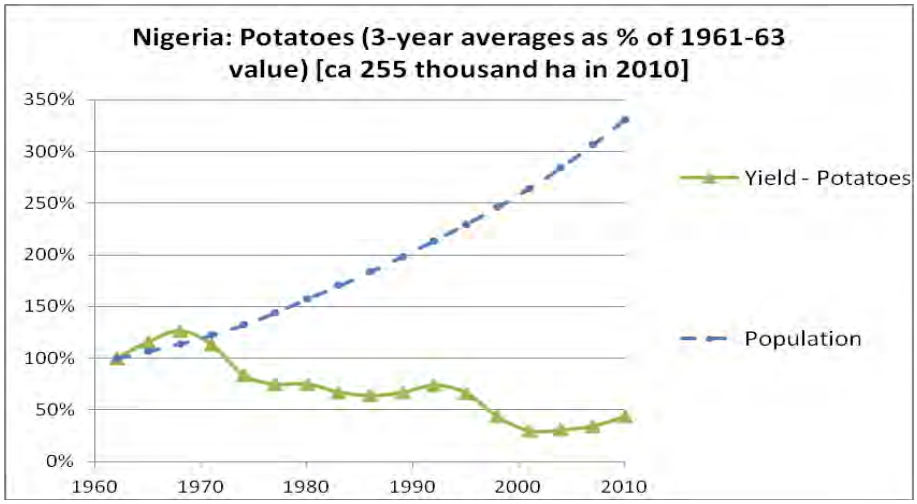


Figure 11g-1: Eggs as a recently successful agricultural product in Nigeria; performance data 1961-2011

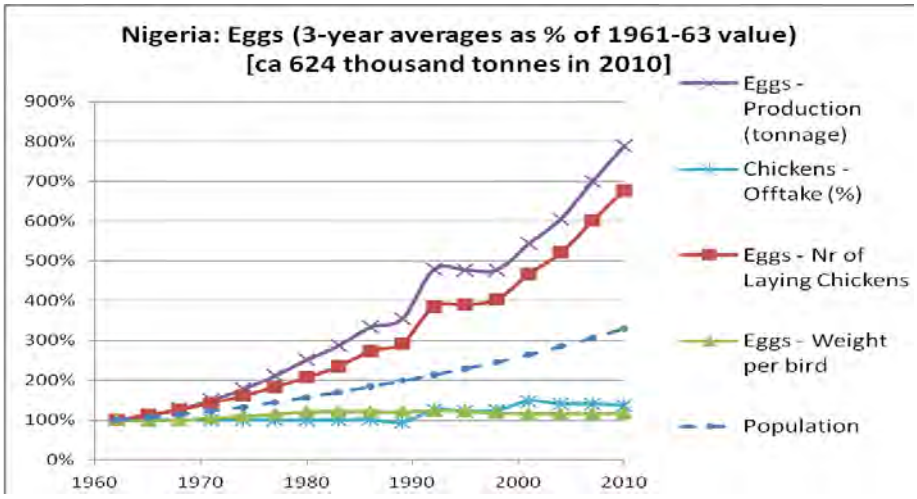
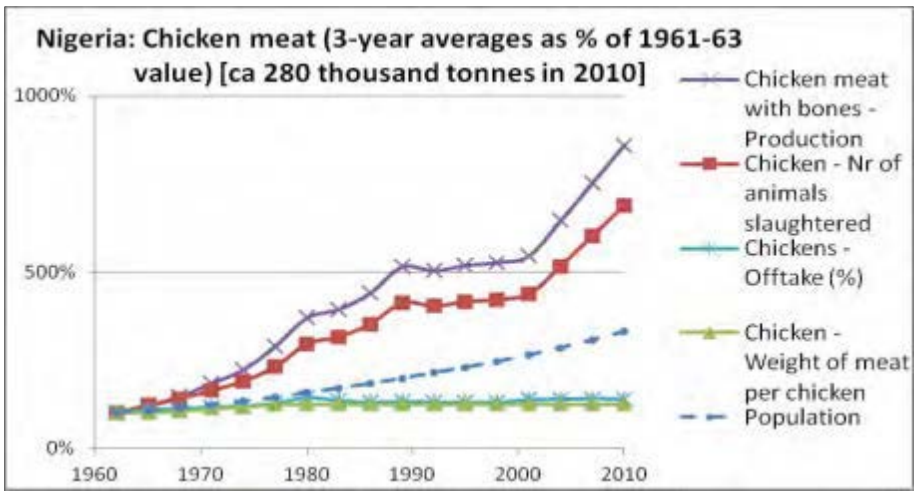


Figure 11g-2: Chicken as a recently successful agricultural product in Nigeria; performance data 1961-2011



4. Nigeria's food security as indicated by child under-nutrition data

As so many other countries in the world, Nigeria is a country with a food paradox. Looking at production data and at food balance data, the country should be able to feed its population adequately. So potential food sufficiency and average food security is guaranteed since a few decades and particularly after 2000. However, potential food sufficiency and average food security does not mean food security for all its citizens. That depends on access to food by the people in the country's different income quintiles. Many people in Nigeria do not have access to enough food, and that is very visible in the country's data on under-nutrition of its under-fives. Nigeria had four child under-nutrition surveys so far. The ones in 1992 and 1998 focused on 0-3 year olds, the ones in 2006 and 2012 on 0-5 year olds (2012: provisional results). From 2006 onwards a new international growth standard was used. The main conclusion is that child under-nutrition is a very serious problem in Nigeria despite some improvement over the years(see Figure 12). In some areas there still is an emergency situation. According to the NDHS study for 2008, that was published in 2009, acute under-nutrition is high in the first two years of children's lives in Nigeria; and chronic under-nutrition accumulates among children up to three years old and then gradually improves for older children. Children in rural areas are worse off than those in urban areas (see Figure 13), and children in the Northwest are much worse off compared to children in the Southeast. In the Northwest, under-five children on average are 35% underweight and more than 50% stunted (see Figures 14 and 15). For Nigeria as a whole the study concludes that boys are slightly worse off than girls (see Figure 16). As everywhere else, child under-nutrition improves when the income situation of parents improves (see Figure 17). However, even for children in relatively rich households, on average, the wasting and stunting is a quite serious problem in Nigeria.

Figure 12: Child under-nutrition in Nigeria (2008 NDHS survey report)

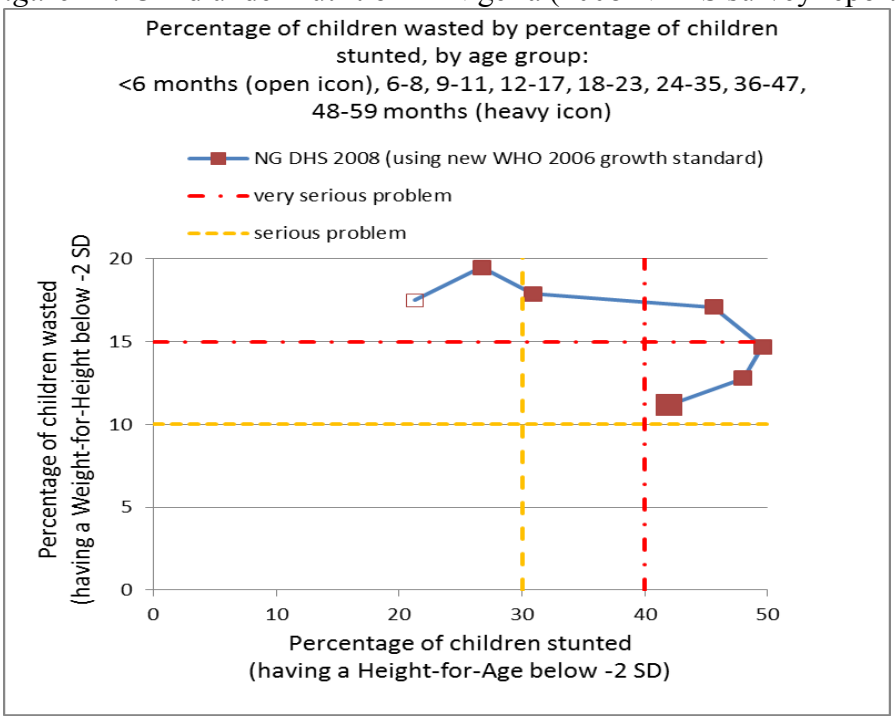


Figure 13: Child under-nutrition in Nigeria; 2008 DHS: rural and urban

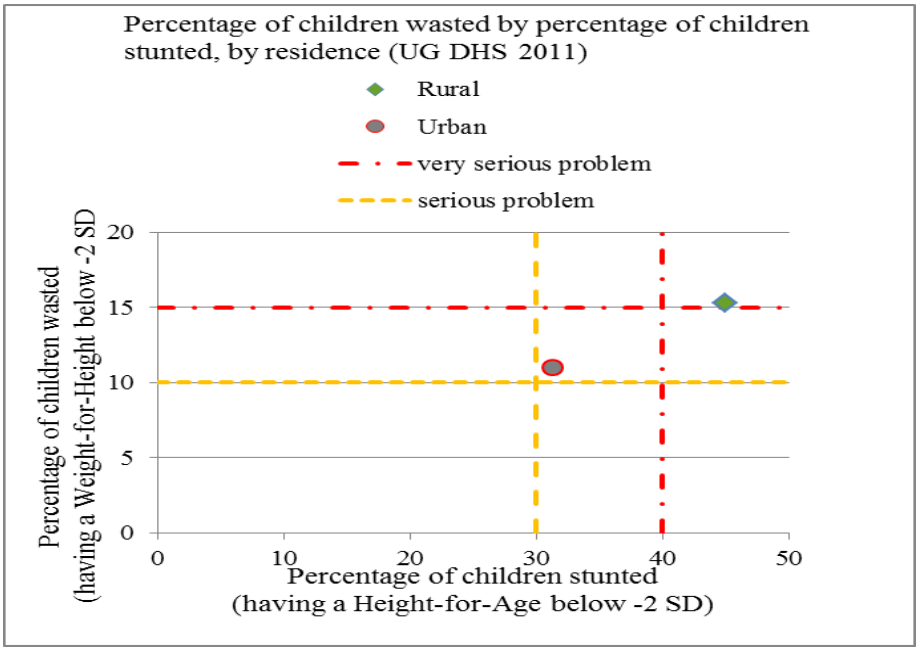


Figure 14: Child under-nutrition in Nigeria; 2008 DHS: regional differences

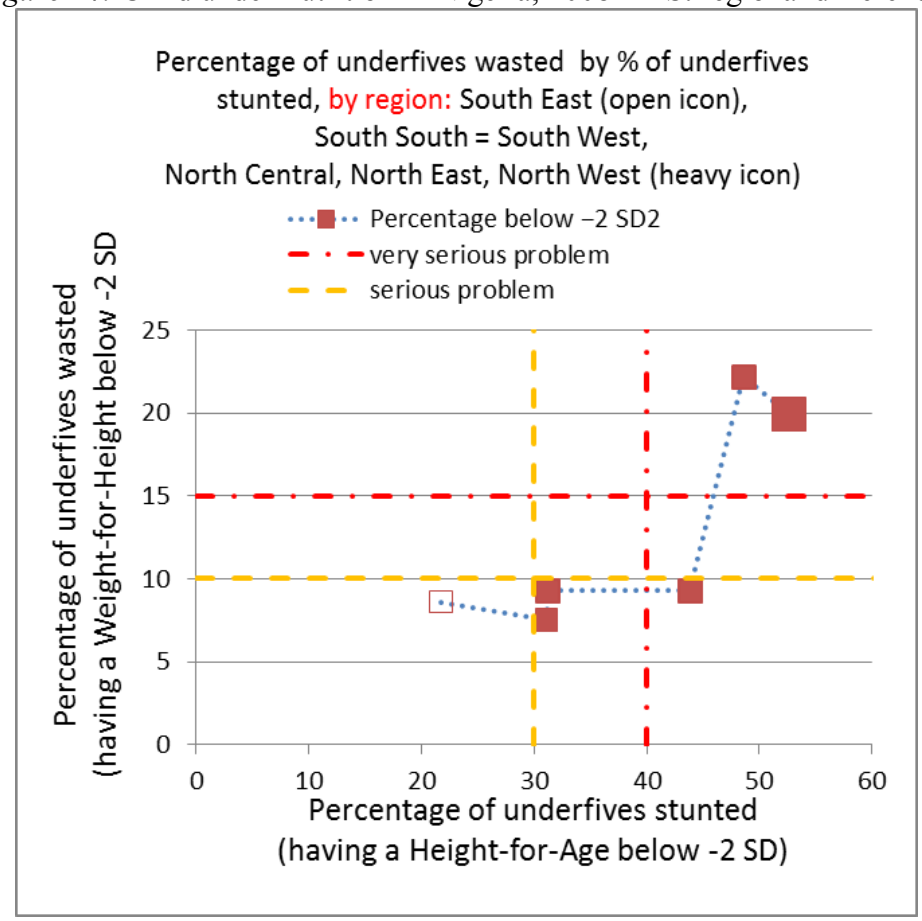
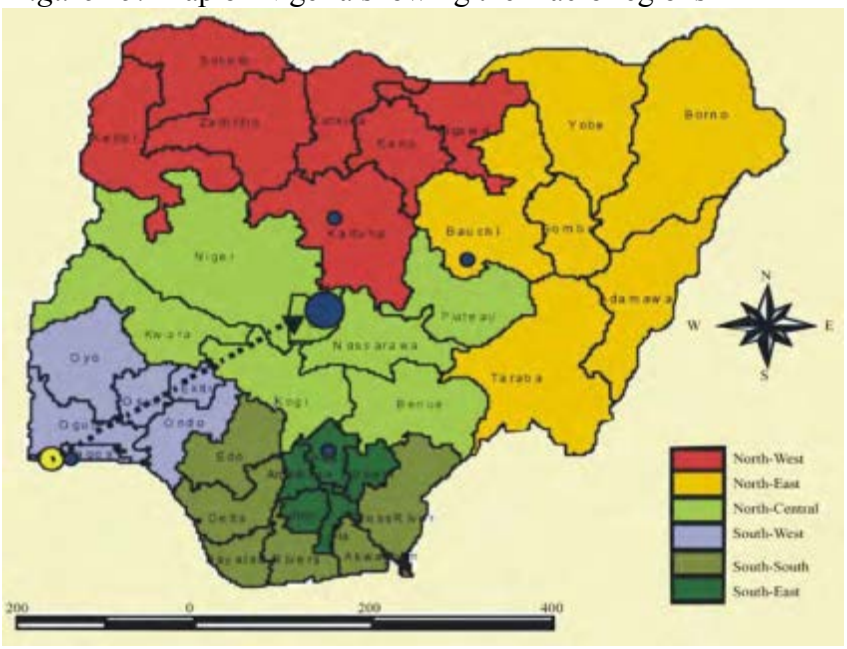


Figure 15: Map of Nigeria showing the macro regions



Source: http://www.nnadeaf.org/, accessed October 28, 2013.

Figure 16: Child under-nutrition in Nigeria; 2008 DHS: boys and girls

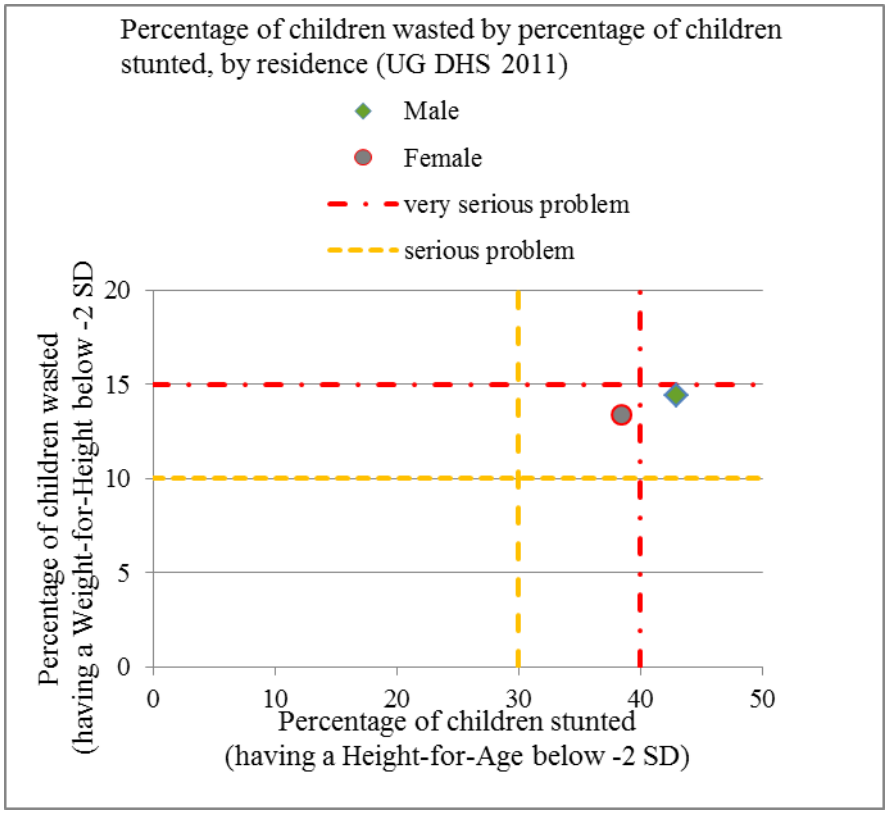
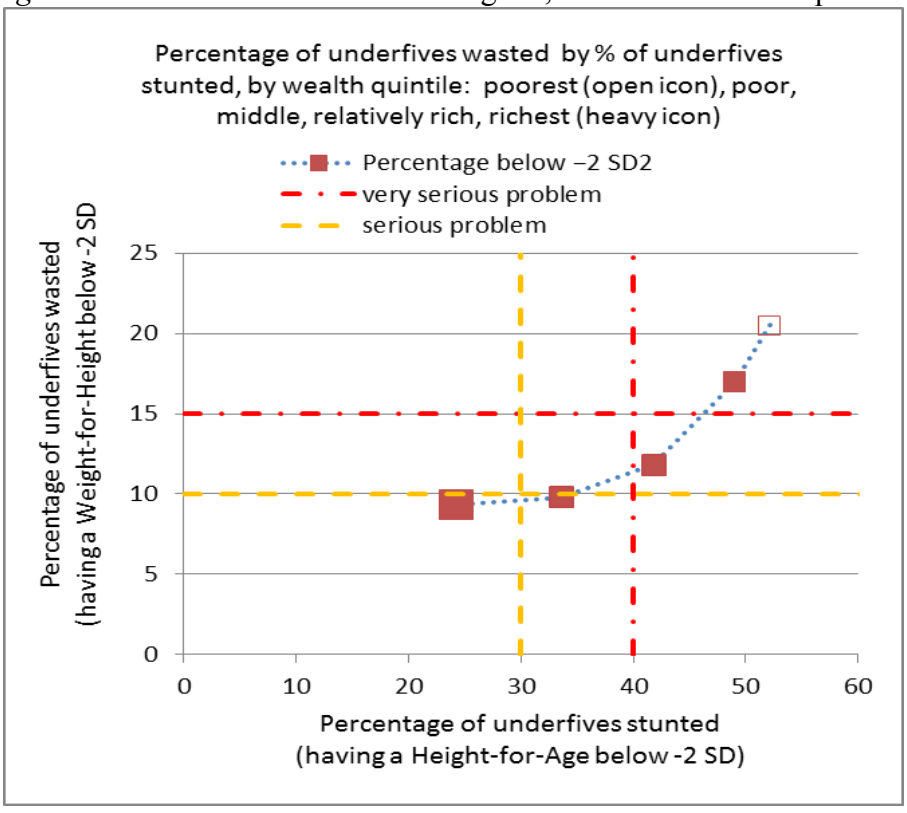
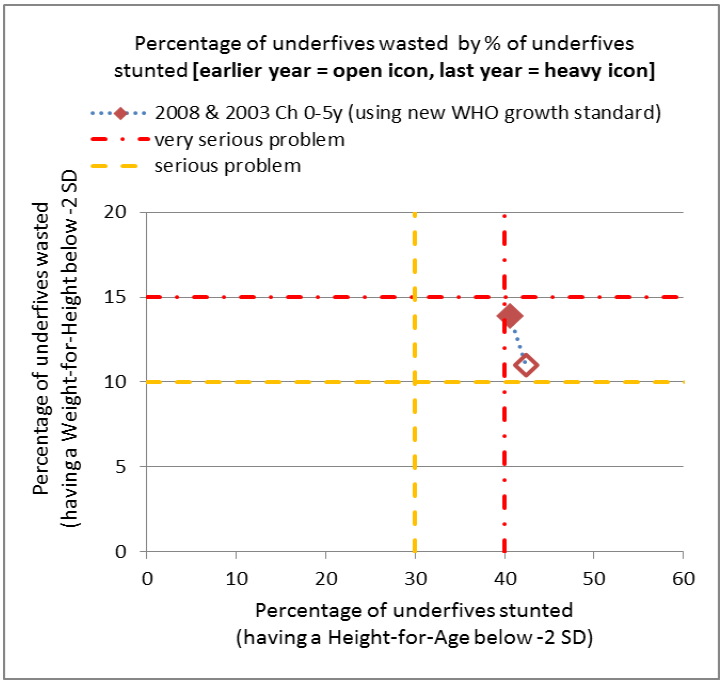


Figure 17: Child under-nutrition in Nigeria, 2008 DHS: wealth quintiles



If we compare NDHS 2008 and 2003, the trend in nutritional status of young children in Nigeria shows a slight decrease in chronic under-nutrition (stunting), but an increase in acute under-nutrition (underweight) (see Figure 18).

Figure 18: Trend in child under-nutrition, Nigeria 2003-2008



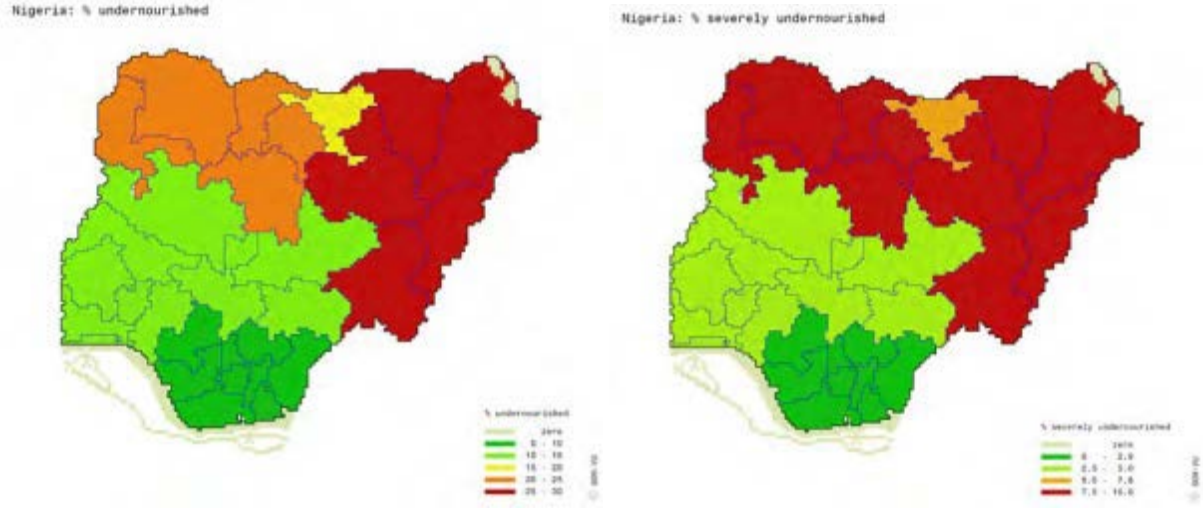
The UNESCO factsheet on Nigeria, published in 2006, revealed a more gloomy picture of Nigeria's under-nutrition problems[3]:

> According to the last National Demographic and Health Survey (NDHS, 2003), 29% of Nigerian children under five years are considered underweight. Today Nigeria is among the ten countries in the world with the largest number of underweight children, with an estimated 6 million children under five who are underweight. (…) In Nigeria, it is estimated that malnutrition contributes to over 50% of mortality among children aged under-five years.

The areas of under-nutrition and severe under-nutrition also appear on Nigerian maps, as produced by the Centre for World Food Studies in Amsterdam (see Figures 19a/b and 20a/b).

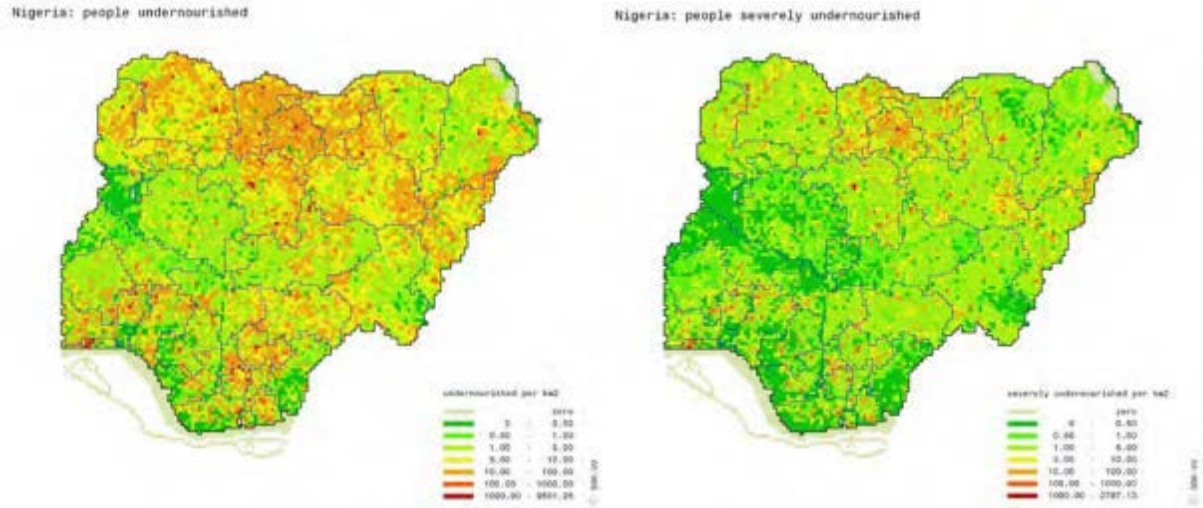
[3] Source: http://www.unicef.org/wcaro/WCARO_Nigeria_Factsheets_Nutrition.pdf

Figure 19a/b: Undernourished and severely undernourished areas in Nigeria



Source: Van Wesenbeeck, C.F.A. & M.D. Merbis (2012), *Africa in Maps. Data repository of the food economy in Sub-Saharan Africa*. Amsterdam: Centre for World Food Studies

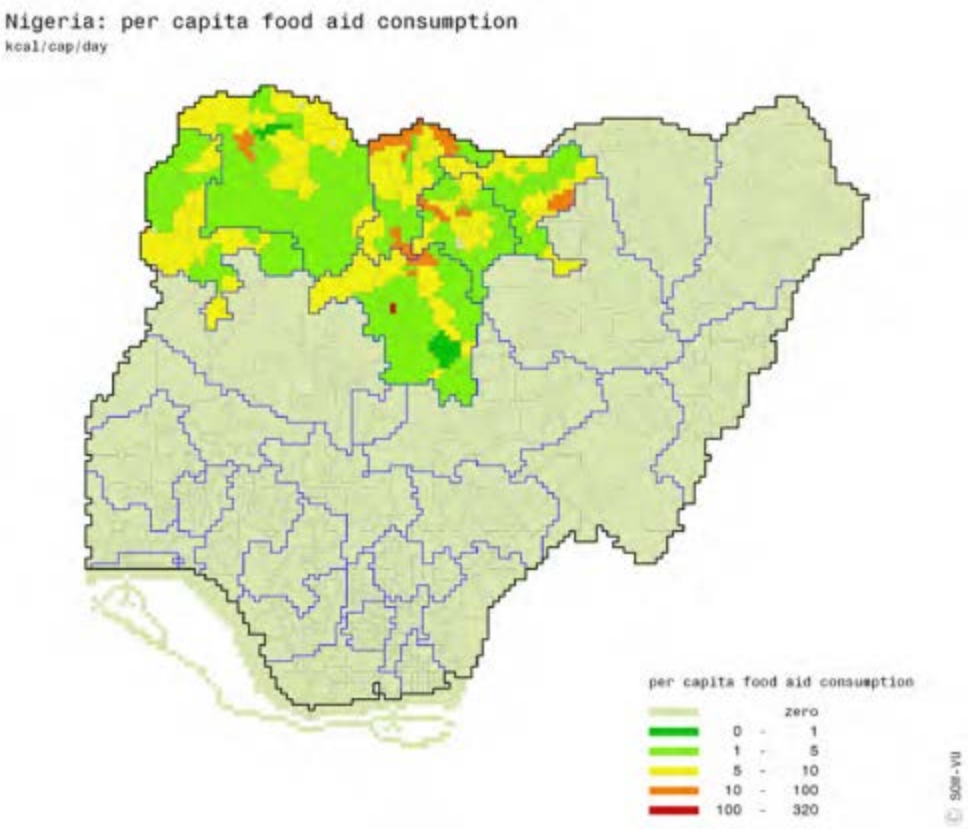
Figure 20 a/b: Number of people undernourished and severely undernourished in Nigeria



Source: Van Wesenbeeck, C.F.A. & M.D. Merbis (2012), *Africa in Maps. Data repository of the food economy in Sub-Saharan Africa*. Amsterdam: Centre for World Food Studies

Food aid has become a standard element of food provisioning in some of these regions in Nigeria, particularly in northern areas affected by on-going conflicts. Figure 21 gives some details.

Figure 21: Food aid in Nigeria: regional distribution of per capita food aid



Source: Van Wesenbeeck, C.F.A. & M.D. Merbis (2012), *Africa in Maps. Data repository of the food economy in Sub-Saharan Africa*. Amsterdam: Centre for World Food Studies

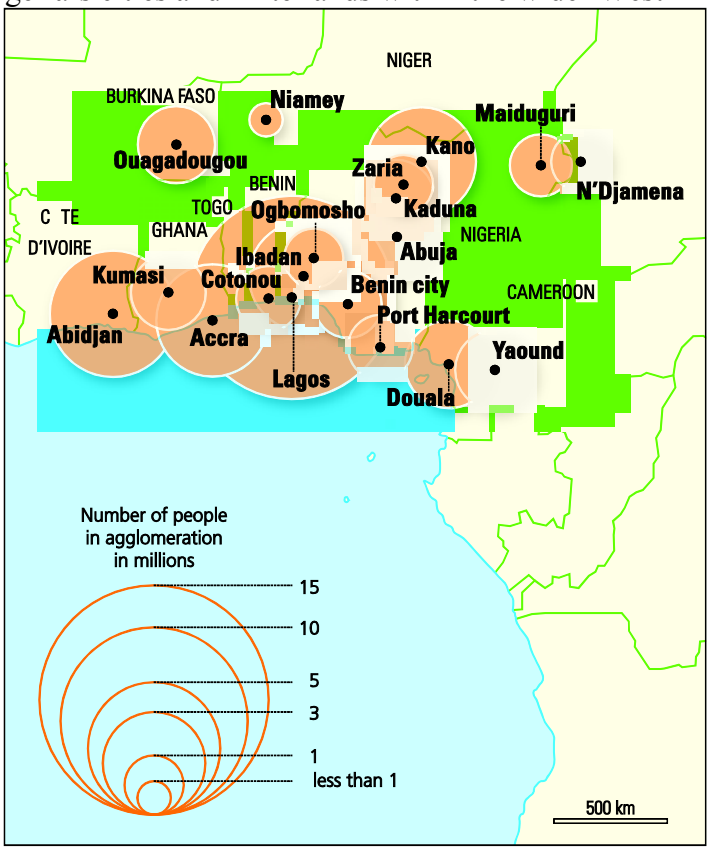
5. DRA/ASC-AFCA research questions for Nigeria

Nigeria shows a paradox: after a period of agricultural deterioration in the 1970s and 1980s the country experienced a rapid recovery of its agricultural production after 1990 and after 2000 many crops and livestock species can even be regarded as highly successful. However, a considerable part of the Nigerian population does not seem to benefit much from the agricultural revolution taking place. Child under-nutrition data are quite dramatic, particularly in rural areas, and especially in the Northern part of the country.

The rapid economic growth figures for the country since the late 1990s created a growing demand for its agricultural and livestock produce, particularly in the booming cities. According to the 'Citypopulation' website,[4] Nigeria currently has ten metropolitan agglomerations of more than a million inhabitants: Lagos (11.8m.), Kano (3.4m.), Ibadan (3.4m.), Abuja (2.0m.), Kaduna (1.7m.), Benin (1.3m.), Port Harcourt (1.2m.), Maiduguri (1.1m.), Ogbomosho (1.0m.) and Zaria (1.0 m.) (see Figure 22). Nigeria's urbanization level increased from 19% in 1960 to 40% in 2012[5] and is expected to go beyond 50% soon.

[4] www.citypopulation.de/world/Agglomerations
[5] w.issafrica.org/iss-today/eye-on-urbanisation-nigeria

Figure 22: Nigeria's cities and hinterlands within the wider West African Region[6]



Source: From ASC Thematic Map "Africa: From a continent of states to a continent of cities".[7]

In the Agro-Food Clusters project of the African Studies Centre in Leiden, the main hypothesis is that the rapid expansion of urban demand in Africa is a major driving force of agricultural expansion. However, in the debate about Africa's recent agricultural growth three major intervening but connected variables are mentioned as well: government policy, business development and external demand.

For Nigeria, it seems useful to do a detailed study about **maize**, **cassava**, **rice** and **melon seed** as the most important successful major crops, and about **chicken** as a clearly successful livestock species, with the highest recent growth figures.

For these 'booming agricultural commodities' in Nigeria we can formulate the following questions for systematic follow-up research:

- How do the value chains look like, what are major production and consumption areas, and how are these linked; what are the major stakeholders in the chain?
- What are the major supporting agencies and institutions (government, business and other) and how do these agencies judge the reasons for the good performance of these successful agricultural products? What are local, national and international elements in the chain of innovation and how do they relate?

[6] Copy from https://openaccess.leidenuniv.nl/handle/1887/20017: Nigeria section of that map. Reference: https://openaccess.leidenuniv.nl/bitstream/handle/1887/20017/Africa%20poster%20Urbanization%202012.pdf?sequence=2 .

[7] See previous footnote.

- What have been major incentives and disincentives for the recent production and yield increases according to farmers and other stakeholders in the production-consumption chains?
- To understand the link between potential food sufficiency, average food security and nutrition impact of food expansion, particularly for the bottom quintile of the income groups, we could look into the access to these 'boom commodities' by the poorest quintile of food consumers in the country, and hence also include an analysis of explicit poverty alleviation policies of government and other relevant policy agencies in Nigeria, in general as well as for these boom commodities.
- But it is also important to see how agricultural products produced in Nigeria are being exported, and to what countries. Is Nigeria's food part of a new 'scramble for Africa's resources'? And what is the recent history of food imports and where do these come from?

6. An inventory of relevant background information

A quick search of relevant sources in the academic and non-academic literature available in and around the African Studies Centre in Leiden and on the web gives us the following recent sources, which may be helpful for further preparations of the systematic comparative study that we envisage, as far as Nigeria is concerned. The search has been limited to sources published between 1993 and 2013, and only if Nigeria has been explicitly mentioned. We start with more general literature about what may be called 'agricultural dynamics', continue with literature about Nigeria's food security and nutrition situation and end with specific attention for the five agricultural products that we would like to study: maize, cassava, rice, melon seed and poultry. Where available as a free online source, we also give the URL.

Agricultural dynamics

Abdulkadir, A. 2012. *Nutrient flows in urban and peri-urban agro-ecosystems in three West African cities.* [S.l.: s.n.] [Diss. Wageningen].

Adesimi, A.A. 1995. *Improving farmers' management capability in Nigeria : historical perspective and empirical evidence.* Ile-Ife: Obafemi Awolowo University Press. (Inaugural lectures series ; 110).

Adubi, A.A. 2000. The economic behaviour of Nigerian small scale farmers: implications for food policy in the 1990s. *Discovery and Innovation*, vol. 12, no. 3/4, pp. 199-210.

Akinola, O.A. 1998. Reorganising the farmers, c. 1930-1992: structural adjustment and agricultural politics in Ondo State, southwestern Nigeria. *The Journal of Modern African Studies*, vol. 36, no. 2, pp. 237-264.

Alimi, T. 2007. A comparative study of the economic performance of farmers under large scale and motorized pump irrigation systems in Katsina State of Nigeria. *Discovery and Innovation*, vol. 19, no. 4, pp. 28-37.

Aromolaran, A.B. & Olayemi, J.K. 2000. Analysis of factors affecting the preference intensity of farmers for selected farm production objectives. *African Development Review*, vol. 12, no. 1, pp. 114-127.

Aromolaran, A.B. & Olayemi, J.K. 1997. Analysing farmers' resource allocation behaviour through models comparison : a case of Nigeria food crop farmers. *The Nigerian Journal of Economic and Social Studies*, vol. 39, no. 1, pp. 47-59.

Babatunde, R.O. 2012. *Assessing the effect of off-farm income diversification on agricultural production in rural Nigeria.* Leiden: African Studies Centre. (ASC working paper ; 106). http://hdl.handle.net/1887/20202

Bassir, I.B. & Ekpere, J. 2002. A comparative study of the adoption of three types of agricultural innovations in the Oyo State of Nigeria. *Discovery and Innovation*, vol. 14, no. 3/4, pp. 161-165.

Berkhout, E.D. 2009. *Decision-making for heterogeneity : diversity in resources, farmers' objectives and livelihood strategies in northern Nigeria.* [S.l.: s.n.] [Diss. Wageningen].

Dibua, J.I. 2002. Agricultural modernization, the environment and sustainable production in Nigeria, 1970-1985. *African Economic History* no. 30, pp. 107-137.

Dike, E. 1999. Explaining investment allocation to agriculture in Nigeria : beyond the domestic terms of trade (DTT) hypothesis. *The Nigerian Journal of Economic and Social Studies*, vol. 41, no. 2, p. 295-313.

Ezumah, N.N. & Di Domenico, C.M. 1995. Enhancing the role of women in crop production : a case study of Igbo women in Nigeria. *World Development*, vol. 23, no. 10, pp. 1731-1744.

Freeman, H.A. 1994. Population pressure, land use, and the productivity of agricultural systems in the West African savanna. In: *Issues in African rural development 2.* Breth, S.A. (ed.) pp. 103-114.

Gadzama, N.M. [et al.]. 2004. Analysis of agricultural sector in Borno State : constraints and way forward for sustainable agricultural development. *Annals of Borno*, vol. 21/22, pp. 123-141.

Garba, A.G., Kwanashie, M., & Ajilima, I. 1998. Price and non-price output response of crops, subsectoral aggregates and commodity exports. *The Nigerian Journal of Economic and Social Studies*, vol. 40, no. 2, pp. 241-270.

Garba, P.K. 1999. Does government keep its word? : an analysis of the implementation of agricultural policies in Nigeria, 1970-1993. *The Nigerian Journal of Economic and Social Studies*, vol. 41, no. 3, pp. 421-466.

Haque, M.A. 1998. A case for conservation tillage research in the arid zone of Nigeria. *Discovery and Innovation*, vol. 10, no. 1/2, pp. 100-105.

Ihimodu, I.I. 1993. *The structural adjustment programme and Nigeria's agricultural development.* Ibadan: National Centre for Economic Management and Administration. (NCEMA monograph series).

Ikpe, E.B. 1994. *Food and society in Nigeria : a history of food customs, food economy and cultural change 1900-1989.* Stuttgart: Steiner. (Beiträge zur Kolonial- und Überseegeschichte; Bd. 59).

Iwuagwu, O. 2008. Colonial and post-independence agricultural policies in Eastern Nigeria, 1946-1980. *Lagos Historical Review*, vol. 8, pp. 64-78.

Jagtap, S.S. 1995. Changes in annual, seasonal and monthly rainfall in Nigeria during 1961-90 and consequences to agriculture. *Discovery and Innovation*, vol. 7, no. 4, pp. 337-348.

Kagu, A. & Maina, A. 2010. Effects of sand mining on agricultural activities on the Bama Ridge, north eastern Nigeria. *Journal of Environment and Culture*, vol. 7, no. 2, pp. 86-102.

Korieh, C.J. 2001. The invisible farmer? : women, gender, and colonial agricultural policy in the Igbo region of Nigeria, c. 1913-1954. *African Economic History* no. 29, pp. 117-162.

Krings, M. & Sarch, M.T. 2002. Institutional evolution at Lake Chad : lessons for fisheries management. In: *Africa's inland fisheries : the management challenge.* Geheb, K. & Sarch, M.T. (eds.) Kampala : Fountain Publishers, pp. 211-227.

Kwanashie, M., Ajilima, I., & Garba, A.G. 1997. Model for evaluating the response of agriculture to adjustment policies in Nigeria. *The Nigerian Journal of Economic and Social Studies*, vol. 39, no. 1, pp. 19-45.

Lawal, A.A. 2001. The negative impact of structural adjustment programme on agriculture in Nigeria. *The Nigerian Journal of Economic History* no. 4, pp. 61-69.

Likita, T. 2000. Fertilizer subsidy policy : implications for investment in the agricultural sector. *The Nigerian Journal of Economic and Social Studies*, vol. 42, no. 3, pp. 401-410.

Manyong, V.M. [et al]. 2005. *Agriculture in Nigeria: identifying opportunities for increased commercialization and investment.* Ibadan: IITA. http://books.google.nl/books?hl=nl&lr=&id=UAzSiaumx1AC&oi=fnd&pg=PR9&dq=nigeria+agricultural+revolution&ots=6MSkt3ST7b&sig=xIfsB-QvddMm-MsVu9G1y7fDNhU#v=onepage&q=nigeria%20agricultural%20revolution&f=false

Meagher, K. 2000. Veiled conflicts: peasant differentiation, gender and structural adjustment in Nigerian Hausaland. In: *Disappearing peasantries? : rural labour in Africa, Asia and Latin America.* Bryceson, D., Kay, C. & Mooij, J. (eds.), pp. 81-98.

Mijindadi, N.B. & Abidogun, A. 1993. *Investment opportunities in Nigerian agriculture.* Ibadan: Federal Agricultural Coordinating Unit. (Occasional paper series ; 8).

Mustapha, A.R. 2011. Zimbabwean farmers in Nigeria: exceptional farmers or spectacular support? *African Affairs*, vol. 110, no. 441, pp. 535-561.

Nwaru, J.C. & Ndukwu, P.C. 2011. Estimation of farm level technical efficiency and its determinants among male and female sweet potato farmers in Imo State, Nigeria. *Ethiopian Journal of Economics*, vol. 20, no. 1, pp. 99-112.

Nwomonoh, J.N. 1994. The role of African women in rural development : the Nigerian case. In: *Environmental and economic dilemmas of developing countries : Africa in the twenty-first century.* James, V.U. (ed.), pp. 183-188.

Ogundari, K., Amos, T.T., & Okoruwa, V.O. 2012. A review of Nigerian agricultural efficiency literature, 1999-2011 : what does one learn from frontier studies? *African Development Review*, vol. 24, no. 1, pp. 93-106.

Ojo, M.O. 1994. Agricultural performance and policy under the structural adjustment programme in Nigeria. *The Nigerian Journal of Economic and Social Studies*, vol. 36, no. 2, pp. 335-352.

Okike, I. [et al.]. 2004. Factors affecting farm-specific production efficiency in the savanna zones of West Africa. *Journal of African Economies*, vol. 13, no. 1, pp. 134-165.

Okolie, A.C. 1995. Oil rents, international loans and agrarian policies in Nigeria, 1970-1992. *Review of African Political Economy*, vol. 22, no. 64, pp. 199-212.

Okolie, A.C. 1994. *Oil rents, international aid regime, and agrarian policies in Nigeria, 1970-1992.* Toronto: [African Studies Association].

Okunmadewa, F. (ed.) 2002. *Poverty reduction and the Nigeria agricultural sector.* Mokola [etc.]: Elshaddai Global Ventures.

Oladapo, M.O. & Momoh, S. 2008. Price transmission and market integration in Oyo State, Nigeria. *African Development Review*, vol. 20, no. 3, pp. 497-504.

Olorunfemi, A. & Adesina, O.C. 1998. Politics and Nigerian agriculture in the first decade of the "oil boom", 1970-1980 : a preliminary assessment. *The Nigerian Journal of Economic History* no. 1, pp. 57-69.

Onyenwaku, C.E. 1994. Economics of irrigation in crop production in Nigeria. In: *Issues in African rural development 2*. Breth, S.A. (ed.), pp. 129-138.

Oyeleye, D.A. 1994. Agricultural development in Nigeria : a case study of the utility of agro-service system. *The Nigerian Geographical Journal*, vol. 1, pp. 165-186.

Phillips, A.O., Titilola, S.T., & Akande, S.O. 1998. *Crop production trends and variability in Nigeria 1990-1995.* Ibadan: NISER.

Swindell, K., Iliya, M.A., & Mamman, A.B. 1999. Making a profit, making a living: commercial food farming and urban hinterlands in north-west Nigeria. *Africa / International African Institute*, vol. 69, no. 3, pp. 386-403.

Talla, R.T. 2003. Traditional farming methods in the Mambilla plateau : the need for a retention of valuable cultural practices. *West African Journal of Archaeology*, vol. 33, no. 1, pp. 47-67.

Thliza, M.G. & Pur, J.T. 2006. An assessment of the Nigerian Agricultural Insurance Scheme on crop production in Borno State, Nigeria. *Annals of Borno*, vol. 23/24, pp. 187-195.

Tobor, J.G. 1994. *A fisheries policy for Nigeria.* Lagos: Nigerian Institute for Oceanography and Marine Research (NIOMR). (Technical paper).

Tshibaka, T. (ed.) 1998. *Structural adjustment and agriculture in West Africa.* Dakar: Codesria. (Codesria book series).

Udoh, E.J. & Akintola, J.O. 2001. Measurement of the technical efficiency of crop farms in the southeastern region of Nigeria. *The Nigerian Journal of Economic and Social Studies*, vol. 43, no. 1, pp. 93-104.

Ugbe, U.P. 2010. *It may take a little while…: insights on agricultural research for innovation and development in Nigeria.* London: DfID. (Research into Use Program, discussion paper ; 5). http://r4d.dfid.gov.uk/PDF/Outputs/ResearchIntoUse/riu10discuss05nginsightugbe.pdf

Ukpong, I.I. & Iniodu, P.U. 1994. The impact of the structural adjustment programme on Nigerian agriculture. *The Nigerian Journal of Economic and Social Studies*, vol. 36, no. 2, pp. 353-367.

Umoh, G.S. 2001. Governance, policies and the growth of Nigeria's agriculture. *The Nigerian Journal of Economic and Social Studies*, vol. 43, no. 3, pp. 341-363.

Umoh, G.S. & Yusuf, S.A. 1999. An empirical analysis of the poverty status and productivity of rural farmers in Obubra, Cross River State, Nigeria. *Nigerian Journal of Economic and Social Studies*, vol. 41, no. 2, pp. 259-273.

Uwadibie, N.O. 2000. *Decentralization and economic development in Nigeria : agricultural policies and implementation.* Lanham, Md. [etc.]: University Press of America.

Yunusa, M.B. 1993. Hi-technology industry in a rural area : the reaction of peasant agriculture. *Savanna*, vol. 14, no. 2, pp. 126-137.

Food security

Akinyele, I.I. 1994. *Give us this day our daily bread : an inaugural lecture.* Ibadan: University of Ibadan.

Berck, P. & Bigman, D. (eds.) 1993. *Food security and food inventories in developing countries.* Wallingford: CAB International.

Dirorimwe, C. 1998. Participatory development of a household food security and nutrition improvement programme in Kano State, Nigeria. *Food, Nutrition and Agriculture* no. 22, pp. 36-46.

Falola, T. & Okpeh, O.O. (eds.) 2008. *Population movements, conflicts, and displacements in Nigeria.* Trenton, NJ: Africa World Press.

Iruonagbe, T.C. 2010. Gender equity and food security : lessons from Ozalla community, Edo State, Nigeria. *African Renaissance*, vol. 7, no. 3/4, pp. 89-110.

Motala, S. (ed.) 2010. *Gender, food and nutrition security in the context of the global economic crisis.* Durban: Agenda Feminist Media. (Agenda ; 86).

Okunmadewa, F., Olomola, A., & Adubi, B. 1999. *Trade liberalisation and food security : situation analysis in Nigeria.* Ibadan: Development Policy Centre (DPC). (Research report ; 17).

Osunwole, S.A. 1999. Economic relevance of ethnomedicinal plants to national food security. *The Nigerian Journal of Economic History* no. 2, pp. 56-67.

Porter, G. 1994. Food marketing and urban food supply on the Jos Plateau, Nigeria : a comparison of large and small producer strategies under "SAP". *The Journal of Developing Areas*, vol. 29, no. 1, pp. 91-110.

Maize

Adetunji, M.O. 2009. Profitability evaluation of maize storage techniques by farmers and traders in Kwara State, Nigeria. *Journal of Food Products Marketing*, vol. 15, no. 4, pp. 392-405. http://sfx.leidenuniv.nl:9003/sfx_local/?sid=LOPC:LOPC&issn=1045-4446

Aye, G.C. & Mungatana, E.D. 2013. Evaluating the performance of small scale maize producers in Nigeria : an integrated distance function approach. *Review of urban & regional development studies : journal of the Applied Regional Science Conference*, vol. 25, no. 2, pp. 79-92. http://sfx.leidenuniv.nl:9003/sfx_local/?sid=LOPC:LOPC&issn=0917-0553

Bamire, A.S. & Manyong, V.M. 2003. Profitability of intensification technologies among smallholder maize farmers in the forest-savanna transition zone of Nigeria. *Agriculture, Ecosystems & Environment*, vol. 100, no. 2/3, pp. 111-118. http://sfx.leidenuniv.nl:9003/sfx_local/?sid=LOPC:LOPC&issn=0167-8809

Byerlee, D. & Eicher, C. K. (eds.) 1997. *Africa's emerging maize revolution.* Boulder, Col. [etc.]: Lynne Rienner Publishers.

Gilbert, E. 1995. *The meaning of the maize revolution in sub-Saharan Africa : seeking guidance from past impacts.* London: Overseas Development Institute (ODI). (Network paper; 55).

Iken, J.E. & Amusa, N.A. 2004. Maize research and production in Nigeria. *African Journal of Biotechnology*, vol. 3, no. 6, pp. 302-307. http://www.academicjournals.org/AJB/PDF/Pdf2004/Jun/Iken%20and%20Amusa.pdf

Iniodu, P.U. 2002. Appropriate technology for sustainable agriculture in Akwa Ibom State, Nigeria.. *Discovery and Innovation*, vol. 14, no. 1/2, pp. 119-129. [maize and cassava].

Jagtap, S.S., Mornu, M., & Kang, B.T. 1993. Simulation of growth, development and yield of maize in the transition zone of Nigeria. *Agricultural Systems*, vol. 41, no. 2, pp. 215-230. http://sfx.leidenuniv.nl:9003/sfx_local/?sid=LOPC:LOPC&issn=0308-521X

Lawal, B., Saka, J., Oyegbami, A., & Akintayo, I. 2005. Adoption and performance assement of improved maize varieties amoung smallholder farmers in southwest Nigeria. *Journal of Agricultural & Food Information*, vol. 6, no. 1, pp. 35-48. http://sfx.leidenuniv.nl:9003/sfx_local/?sid=LOPC:LOPC&issn=1049-6505

Lubeck, P.M. & Watts, M.J. 1994. An alliance of oil and maize? : the response of indigenous and State capital to structural adjustment in Nigeria. In: *African capitalists in African development.* Berman, B. J. & Leys, C. (eds.) pp. 205-234.

Olaniyi, O.A. & Adewale, J.G. 2012. Information on maize production among rural youth : a solution for sustainable food security in Nigeria. *Library philosophy and practice* no. 4, http://sfx.leidenuniv.nl:9003/sfx_local/?sid=LOPC:LOPC&issn=1522-0222

Olorunnisomo, O.A. & Ayodele, O.J. 2009. Effects of intercropping and fertilizer application on the yield and nutritive value of maize and amaranth forages in Nigeria. *Grass and forage science*, vol. 64, no. 4, pp. 413-421. http://sfx.leidenuniv.nl:9003/sfx_local/?sid=LOPC:LOPC&issn=0142-5242

Tambo, J.A. & Abdoulaye, T. 2012. Climate change and agricultural technology adoption : the case of drought tolerant maize in rural Nigeria. *Mitigation and adaptation strategies for global change : an international journal devoted to scientific, engineering, socio-economic and policy responses to environmental change*, vol. 17, no. 3, pp. 277-293. http://sfx.leidenuniv.nl:9003/sfx_local/?sid=LOPC:LOPC&issn=1381-2386

Cassava

Amans, E.B. 2004. The status of cassava production and strategies for expansion in the semi-arid zone of Nigeria. *Savanna* , vol. 19, no. 1, pp. 21-31.

Asadu, C.L.A. & Enete, A.A. 1997. Food crop yields and soil properties under population pressure in Sub-Saharan Africa : the case of cassava in southeast Nigeria. *Outlook on Agriculture*, vol. 26, no. 1, pp. 29-34.

Bamire, A.S., Alimi, T., & Ayanwale, A.B. 2004. Economic efficiency of land improvement techniques among cassava farmers in the wetlands of Nigeria. *Eastern Africa Journal of Rural Development*, vol. 20, no. 1, pp. 45-56.

Camara, Y. 2002. *Profitability of cassava production systems in West Africa : a comparative analysis (Côte d'Ivoire, Ghana and Nigeria).* Ann Arbor, MI: UMI.

Chianu, J.N., Akintola, J.O., & Kormawa, P.M. 2002. Profitability of cassava-maize production under different fallow systems and land-use intensities in the derived savanna of southwest Nigeria. *Experimental Agriculture*, vol. 38, no. 1, pp. 51-64.

Enete, A.A., Nweke, F.I., & Okorji, E.C. 1995. Trends in food crop yields under demographic pressure in sub-Saharan Africa: The case of cassava in southeast Nigeria. *Outlook on Agriculture*, vol. 24, no. 4, pp. 249-254.

Jekayinfa, S.O. & Olajide, J.O. 2007. Analysis of energy usage in the production of three selected cassava-based foods in Nigeria. *Journal of Food Engineering*, vol. 82, no. 2, pp. 217-226. http://sfx.leidenuniv.nl:9003/sfx_local/?sid=LOPC:LOPC&issn=0260-8774

Nkakini, S.O. & Ceder, O. 2008. Investigation into farm mechanization practices for cassava and yam in Rivers State, Nigeria. *AMA : Agricultural Mechanization in Asia, Africa and Latin America*, vol. 39, no. 4, pp. 22-27.

Nkakini, S.O. [et al.]. 2006. Farm mechanization leading to more effective energy-utilizations for cassava and yam cultivations in Rivers State, Nigeria. *Applied Energy*, vol. 83, no. 12, pp. 1317-1325. http://sfx.leidenuniv.nl:9003/sfx_local/?sid=LOPC:LOPC&issn=0306-2619

Ogundari, I. [et al.]. 2012. Analysis of sustainable cassava biofuel production in Nigeria. *Energy & Environment,* vol. 23, no. 4, pp. 599-619.

Omonona, B., Oni, O., & Uwagboe, A. 2006. Adoption of improved cassava varieties and its welfare impact on rural farming households in Edo State, Nigeria. *Journal of Agricultural & Food Information*, vol. 7, no. 1, pp. 39-56. http://sfx.leidenuniv.nl:9003/sfx_local/?sid=LOPC:LOPC&issn=1049-6505

Onemolease, E. 2002. Extension needs of women cassava farmers in Igueben and Esan Northeast local government areas of Edo State, Nigeria. *Africa Development*, vol. 27, no. 1/2, pp. 116-126.

Oyewole, O.B. & Phillip, B. 2006. Agro-food chains and sustainable livelihood : a case study of cassava marketing in Nigeria. In: *The agro-food chains and networks for development.* Ruben, R., Slingerland, M., & Nijhoff, H. (eds.) [Dordrecht] : Springer, pp. 107-115.

Prudencio, Y.C. & Hassan, R.A. 1994. The food security stabilization roles of cassava in Africa. *Food Policy*, vol. 19, no. 1, pp. 57-64.

Raheem, D. & Chukwuma, C. 2001. Foods from cassava and their relevance to Nigeria and other African countries. *Agriculture and Human Values*, vol. 18, no. 4, pp. 383-390. http://sfx.leidenuniv.nl:9003/sfx_local/?sid=LOPC:LOPC&issn=0889-048X

Sodiya, C., Lawal-Adebowale, O., & Fabusoro, E. 2007. Effect of private and public extension services on adoption of promoted cassava-based technologies in Ogun State, Nigeria. *Journal of Agricultural & Food Information*, vol. 8, no. 1, pp. 35-48. http://sfx.leidenuniv.nl:9003/sfx_local/?sid=LOPC:LOPC&issn=1049-6505

Tsegai, D.W. & Kormawa, P.M. 2009. The determinants of urban households' demand for cassava and cassava products in Kaduna, Northern Nigeria : an application of the AIDS Model. *The European Journal of Development Research*, vol. 21, no. 3, pp. 435-447. http://sfx.leidenuniv.nl:9003/sfx_local/?sid=LOPC:LOPC&issn=0957-8811

Udoh, E.J. & Kormawa, P.M. 2009. Determinants for cassava production expansion in the semi-arid zone of West Africa. *Environment, Development and Sustainability*, vol. 11, no. 2, pp. 345-357. http://sfx.leidenuniv.nl:9003/sfx_local/?sid=LOPC:LOPC&issn=1387-585X

Ugwu, B.O. 1996. Increasing cassava production in Nigeria and prospects for sustaining the trend. *Outlook on Agriculture*, vol. 25, no. 3, pp. 179-186.

Ugwu, B.O. & Nweke, F.I. 1996. Determinants of cassava distribution in Nigeria. *Agriculture, Ecosystems & Environment*, vol. 60, no. 2/3, pp. 139-156. http://sfx.leidenuniv.nl:9003/sfx_local/?sid=LOPC:LOPC&issn=0167-8809

Ugwu, B.O. & Ukpabi, U.J. 2002. Potential of soy-cassava flour processing to sustain increasing cassava production in Nigeria. *Outlook on Agriculture*, vol. 31, no. 2, pp. 129-133.

Rice

Abo, M. [et al.]. 2003. The challenges of rice varietal development and production in lowland rice ecology in Nigeria. *Journal of Agricultural & Food Information*, vol. 5, no. 1, pp. 51-66. http://sfx.leidenuniv.nl:9003/sfx_local/?sid=LOPC:LOPC&issn=1049-6505

Akande, T. 2013. *An overview of the Nigerian rice economy*. Nigerian Institute of Social and Economic Research (NISER). http://www.unep.ch/etu/etp/events/Agriculture/nigeria.pdf

Alarima, C.I. [et al.]. 2012. Land rights and rental systems : implications for management of conflicts related to land in sawah-based rice production systems in Nigeria. *African Study Monographs*, vol. 33, no. 3, pp. 189-208.

Amoke Awotide, B. [et al.]. 2013. Impact of seed voucher system on income inequality and rice income per hectare among rural households in Nigeria : a Randomized Control Trial (RCT) approach. *Quarterly Journal of International Agriculture*, vol. 52, no. 2, pp. 95-118.

Chikwendu, D.O. & Chinaka, C.C. 2001. Productivity of chemical pest control inputs on rice production on Anambra State of Nigeria. *Discovery and Innovation*, vol. 13, no. 1/2, pp. 63-66.

Dontsop Nguezet, P.M. [et al.]. 2011. Impact of improved rice technology (NERICA varieties) on income and poverty among rice farming households in Nigeria : a Local Average Treatment Effect (LATE) approach. *Quarterly Journal of International Agriculture*, vol. 50, no. 3, pp. 267-293.

Idiong, C.I. & Christian, E.O. 2009. Evaluation of technical efficiency and its determinants in small scale rice production in the south-south zone of Nigeria. *Indian Journal of Economics*, vol. 89, no. 355, pp. 523-536.

Igbokwe, E.M. 1999. From process to innovation : land use intensity practices among smallholder rice farmers in eastern Nigeria. *Indigenous Knowledge and Development Monitor*, vol. 7, no. 1, pp. 3-7.

Imolehin, E.D. & Wada, A.C. 2000. Meeting the rice production and consumption demands of Nigeria with improved technologies. *International Rice Commission Newsletter*, vol. 49, pp. 33-41.

Njoku, J.E. & Nweke, F.I. 1994. Household food consumption in a developing economy : evidence on rice from Nigeria. *Journal of International Food & Agribusiness Marketing*, vol. 6, no. 3, pp. 51-65.

Olaleye, A.O. [et al.]. 2008. Soil in suitability evaluation for irrigated lowland rice culture in southwestern Nigeria : management implications for sustainability. *Communications in Soil Science and Plant Analysis*, vol. 39, no. 19, pp. 2920-2938. http://sfx.leidenuniv.nl:9003/sfx_local/?sid=LOPC:LOPC&issn=0010-3624

Onyebuchi, G. 1997. Government rice projects : case studies of World Bank and River Basin Projects in Nigeria under Operation Feed the Nation programme : survey findings. *Journal of Financial Management and Analysis*, vol. 10, no. 2, pp. 70-73.

Onyenweaku, C.E. & Ohajianya, D.O. 2007. Technical efficiency of rice farmers in south eastern Nigeria. *Indian Journal of Economics*, vol. 88, no. 348, pp. 51-60.

Melon seed

Adeniran, M.O. 1989. *Highlights on egusi melon (Citrullus Latanus) improvement in Nigeria.* Ibadan: National Horticultural Research Institute.

Amadi, E.N. [et al.]. 2003. Melon seeds (Citrullus vulgaris) as a possible substrate for the production of tempe. *Plant Foods for Human Nutrition*, vol. 58, no. 3, pp. 1-11. http://sfx.leidenuniv.nl:9003/sfx_local/?sid=LOPC:LOPC&issn=0921-9668

Amshi, M.A. & Odo, P.E. 2000. A focus on guna melon ('Citrullus colocynthis' Schrad) production in the Sudano-Sahel region of Yobe State, Nigeria. *Annals of Borno*, vol. 17/18, no. 226, pp. 238.

Bankole, S.L.O.A. 2004. Storage practices and aflatoxin B1 contamination of egusi melon seeds in Nigeria. *Tropical Science*, vol. 44, no. 3, pp. 150-153.

Jolaoso, M.A., Ojeifo, I.M., & Aiyelaagbe, I.O.O. 1996. Productivity of plantain (Musa AAB)-melon mixtures in south western Nigeria. *Biological Agriculture and Horticulture*, vol. 13, no. 4, pp. 335-340.

Mohammed, B.T. 2011. Socio-economic analysis of melon production in Ifelodun Local Government Area, Kwara State, Nigeria. *Journal of Development and Agricultural Economics*, vol. 3, no. 8, pp. 362-367. http://www.academicjournals.org/JDAE/contents/2011cont/Aug.htm

Odoemena, C.S. 1997. Yield and yield component responses of intercropping yam (Dioscorea rotundata) and melon (Colocynthis vulgaris) in south-eastern Nigeria. *Tropical Agriculture*, vol. 74, no. 3, pp. 192-197.

Ogbonna, P.E. & Obi, I.U. 2011. Variability of yield and yield components in 'egusi' melon. *African Crop Science Journal*, vol. 18, no. 3, pp. 107-113. http://www.bioline.org.br/abstract?id=cs10013

Yusuf, O. [et al.]. 2008. Profitability of 'egusi' melon (Citrullus Lanatus Thunb. Mansf) production under pole and mixed cropping systems in Kogi State, Nigeria. *Journal of Agricultural and Biological Science*, vol. 3, no. 2, pp. 14-18. http://www.arpnjournals.com/jabs/research_papers/rp_2008/jabs_0308_70.pdf

Poultry

Akidarju, M.S., Onyemaechi, E.G., & Dauda, M.G. 2010. An assessment of some poultry management practices and disease recognition by poultry farmers in Maiduguri arid zone, Nigeria. *World's Poultry Science Journal*, vol. 66, no. 2, pp. 285-297.

Alabi, R.A. & Aruna M.B. 2006. Technical efficiency of family poultry production in Niger-Delta, Nigeria. *Journal of Central European Agriculture*, vol. 6, no. 4, pp. 531-538. http://hrcak.srce.hr/17319

Bamiro, O.M. & Shittu, A.M. 2009. Vertical integration and cost behavior in poultry industry in Ogun and Oyo States of Nigeria. *Agribusiness*, vol. 25, no. 1, pp. 1-15. http://sfx.leidenuniv.nl:9003/sfx_local/?sid=LOPC:LOPC&issn=0742-4477

Fanimo, A.O. [et al.]. (eds.) 2007. *Book of proceedings : 2nd Nigeria International Poultry Summit : 19-22 February, 2007, Abeokuta, Nigeria.* World's Poultry Science Association, Nigeria Branch.

Fanimo, A.O. [et al.]. (eds.) 2005. *Proceedings of the 1st Nigeria International Poultry Summit (NIPS) : theme : the emerging opportunities for poultry production in West Africa.* World's Poultry Science Association, Nigeria Branch.

Hassan, A.A., Nwanta, J., & Mohammad, A. 2007. Profitability analysis of poultry egg production in Kaduna state, Nigeria. *Nigerian Veterinary Journal*, vol. 27, no. 1, pp. 8-16. http://www.ajol.info/index.php/nvj/article/view/3499

Laseinde, E.A.O. 2002. *Poultry : God's gold-mine in the livestock industry.* Akure: Classic educational publishers.

Mbanasor, J.A. & Sampson, A. 2004. Socio-economic determinants of turkey production among Nigerian soldiers. *Discovery and Innovation*, vol. 16, no. 3/4, pp. 149-156.

Okoli, I.C. [et al.]. 2005. Socio-economic characteristics of poultry business entrepreneurs in Imo State, Nigeria. *Journal of Agriculture and Social Research*, vol. 4, no. 2, pp. 100-111. http://www.ajol.info/index.php/jasr/article/view/2821

Ola, S.I., Fafiolu, A.O., & Fatufe, A.A. (eds.) 2009. *Book of proceedings : 3rd Nigeria International Poultry Summit (NIPS 2009) : poultry industry in West Africa, towards millennium development goals.* World's Poultry Science Association, Nigeria Branch.

Onubuogu, G.C. 2012. Factor productivity and efficiency in poultry farming: evidence from broiler production in Imo State, Nigeria. *Journal of Agriculture and Food Sciences*, vol. 10, no. 1, pp. 1-8.

Orajaka, L.J.E. 2005. The role of local chickens in poultry production in Nigeria. *Nigeria Veterinary Journal*, vol. 26, no. 2, p. 68-72. www.ajol.info/index.php/nvj/article/viewFile/3495/912

Rahji, M.A.Y. & Falusi, A.O. 2005. Determinants of poultry firms' participation in the Nigerian Agricultural Insurance Scheme in Oyo State, Nigeria. *Discovery and Innovation*, vol. 17, no. 1/2, pp. 67-73.

Ukoha, O.O. & Augustine, A.C. 2008. Technical efficiency of small scale poultry-egg production in Nigeria : empirical study of poultry farmers in Imo State, Nigeria. *Indian Journal of Economics*, vol. 88, no. 351, pp. 649-660.

7. Useful links on food and nutrition security

http://www.ascleiden.nl/?q=research/projects/food-security-and-african-city-clustering-metropolitan-food-chains	ASC-AFCA Collaborative Research Group: Agro-Food Clusters in Africa (AFCA). This ASC collaborative project on Food security and the African city aims to explore and unpack dynamic urban food systems in Africa. The research outputs of this collaborative project are intended to, in part, serve as inputs for ongoing discussions between the Ministry of Foreign Affairs (MinBuza), the Ministry of Economic Affairs, Agriculture and Innovation (EL&I), the Netherlands African Business Council (NABC), Wageningen University (WUR), and the ASC, amongst others, about the establishment of 'Agro-Food Clusters' (AFC) in and around African cities.

http://www.ascleiden.nl/?q=research/projects/africa%E2%80%99s-food-and-nutrition-security-2010-2050	Africa's food and nutrition security: 2010-2050. This research programme will predict the food and nutritional needs of a number of African countries up to 2050 on the basis of (a) population size, growth rate and composition, (b) nutritional requirements by age and sex, and taking activity levels into account, and (c) demands for various foods. Intra-country and cross-country comparisons will be made regarding the choice of crops grown and the animals kept, and food consumption patterns (depending on dietary preferences, incomes and prices). Estimates will be made of the loss to human health and the economy. The projected demands of the future food basket on natural resources (land, water, fertilizer and energy) and the effects of emissions will also be assessed.
http://www.ascleiden.nl/?q=content/webdossiers/food-insecurity-famine-and-drought-africa	Food (in)security, famine and drought in Africa. The African Studies Centre's library has compiled this web dossier to provide background information on the food (in)security situation in Africa. This coincides not only with the current food crisis in the Horn of Africa but also with the recent decision by the Dutch government to choose food security as one of the focal points of its economic and development cooperation policy.
http://www.ascleiden.nl/?q=content/asc-catalogue	ASC Catalogue. This unique African studies database contains titles of monographs, journal articles and chapters from edited works. Most entries include professional in-depth abstracts. Access to the ASC catalogue is free of charge. Access is available via the Web.
http://www.pbl.nl/en/publications/2012/food-security-in-sub-saharan-africa-an-explorative-study	Food security in sub-Saharan Africa: An explorative study, Report | 02-07-2012. The agricultural production potential of sub-Saharan Africa would be sufficient to make the region food secure. Concerted and region-specific policies are needed to conserve and enhance the natural resource base of soil and nutrients, to make economic growth more beneficial for the poorest populations, and to eradicate the worst cases of malnutrition and food insecurity. In an exploratory study, PBL has analysed environmental and socio-economic trends and identified feasible policy directions at national and international levels.
http://www.sow.vu.nl/	Reporting and research of the world food situation. Understanding and assessing the developments of the world food situation is a permanent and broad based activity of the Centre that covers, among others, the evolving status of malnutrition, agricultural and food policy, natural resource management. The world food situation often serves as motivation for fundamental issues in food and development policy, which are to be disseminated both to policy makers and the general public. With respect to the world food situation the Centre focuses on selected topics that need to be signalled more prominently. One example of recent research on food trends is the pressure that may arise in cereal markets due to the strong increase of meat consumption in fast growing developing countries.
http://apf-down2earth.ning.com/	Agriculture, Food Security and Climate Change. How farmer entrepreneurs deal with the challenges.

https://www.wageningenur.nl/en/Dossiers/file/Dossier-Food-security.htm	Dossier Food security. The world's population is increasing quickly, and it is predicted to grow to 9 billion people in 2050. In less than forty years the earth will gain 2 billion extra inhabitants who will also have to live, work and eat. Fortunately, our prosperity is also predicted to increase, which means that diets will be subject to change.
https://www.wageningenur.nl/en/show/Researchers-combine-food-security-knowledge.htm	Scientists investigating world food issues should unite themselves to provide a sound scientific basis for food security policies. "The way climate scientists have organised themselves in the IPCC, but then a lighter version." That idea arose during the First International Conference on Global Food Security 29 September - 2 October 2013 in Noordwijkerhout, The Netherlands, organised by Wageningen UR (University & Research Centre) and publisher Elsevier. The scientific journal Global Food Security - published by co-organiser Elsevier - will also get a special issue with all results from the conference.
http://www.9billiontofeed.com/en/gafsr.htm	The Global Alliance on Food Security Research. Six leading agri-food universities and research institutions (WUR, INRA, EMBRAPA, UC Davis, Massey University, IVF-CAAS) have joined forces to find ways to increase the world food production in a sustainable manner.
http://seasofchange.net/	Seas of Change: scaling inclusive agro-food markets. "From Islands of Opportunity to Seas of Change". The coming decades require an unprecedented change in global agriculture and food systems to assure food security. Agriculture offers the best opportunity for the estimated 2 billion people living in smallholder households to work and trade their way out of poverty. Significant impact on poverty and food security requires change at scale, both scaling up successful approaches and implementing new approaches with scale built-in to the initial design.
http://www.foodsecure.eu/	FOODSECURE for Policies that Matter. The EU FOODSECURE programme aims to design effective and sustainable strategies for assessing and addressing the challenges of food and nutrition security. FOODSECURE provides a set of analytical instruments to experiment, analyse, and coordinate the effects of short and long term policies related to achieving food security. FOODSECURE impact lies in the knowledge base to support EU policy makers and other stakeholders in the design of consistent, coherent, long-term policy strategies for improving food and nutrition security.
http://www.gainhealth.org	Global Alliance for Improved Nutrition (GAIN). GAIN's mission is to reduce malnutrition through sustainable strategies aimed at improving the health and nutrition of populations at risk.
http://gainmap.gainhealth.org/admin/pdf/Africa.pdf	GAIN Regional Fact Sheet.
http://www.gainhealth.org/sites/www.gainhealth.org/files/Poster_Nigeria.pdf	Nigeria: GAIN has been present in Nigeria since 2007 supporting the most vulnerable to consume nutrient rich staple foods.
http://www.gainhealth.org/partnerships/amsterdam-initiative-against-malnutrition-aim	The Amsterdam Initiative against Malnutrition (AIM), a Dutch partnership model that brings different stakeholders together to improve food and nutrition security. The partners in the initiative develop innovative market-based solutions to malnutrition in Africa and Asia. The partners in AIM all bring in their own expertise. AIM was launched in May 2009 during the GAIN Business Alliance

	Global Forum and its goal is to eliminate malnutrition for 100 million people in Africa by 2015. AIM represents an opportunity to combine the know-how of major players in the food and nutrition industry in seven countries: Kenya, Tanzania, South Africa, Ethiopia, Nigeria, Bangladesh, Indonesia. Dutch Diamond approach – Private, Public, Civil society, Academia. Multi-sector approach (Dutch Diamond approach – Private, Public, Civil society, Academia) to achieve sustainable nutritional results.
https://www.securenutritionplatform.org/Pages/Home.aspx	Secure Nutrition, linking agriculture, food security, and nutrition. The World Bank's SecureNutrition aims to bridge knowledge gaps between agriculture, food security, and nutrition. This platform offers a space to exchange experiences and to disseminate and gather information. Please join us in our quest to foster open development through increasing coordination and collaboration in the generation and sharing of knowledge.
http://www.ifpri.org	International Food Policy Research Institute: sustainable solutions for ending hunger and poverty. A member of the CGIAR Consortium.
http://www.ifpri.org/category/country/west-africa/nigeria	IFPRI Publications and Programs: Nigeria.
http://cgmap.cgiar.org/start.iface?center=IFPRI	CGIAR Medium Term Research Plans: 12 projects in Nigeria.
http://cgmap.cgiar.org/projectListView.iface	CGIAR Medium Term Research Plans: 12 projects in Nigeria.
http://www.cgiar.org/	The Consultative Group on International Agricultural Research (CGIAR) is a global partnership that unites organizations engaged in research for a food secure future.
http://www.cgiar.org/resources/cgiarannual-reports/	
http://library.cgiar.org/bitstream/handle/10947/2789/CGIAR_Annual_Report_2011.pdf?sequence=1	CGIAR is a global partnership that unites organizations engaged in research for a food secure future.
	CGIAR research is dedicated to reducing rural poverty, increasing food security, improving human health and nutrition, and ensuring more sustainable management of natural resources. It is carried out by the 15 centres that are members of the CGIAR Consortium, in close collaboration with hundreds of partner organizations, including national and regional research institutes, civil society organizations, academia and the private sector.
http://www.fao.org/publications/sofi/en/	The State of Food Insecurity in the World.
http://www.fao.org/economic/ess/ess-fs/en/	Food security statistics (Food security exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food which meets their dietary needs and food preferences for an active and healthy life).
http://www.fao.org/economic/ess/ess-fs/fbs/en/	Food balance sheets. Food balance sheets provide essential information on a country's food system through three components: • Domestic food supply of the food commodities in terms of production, imports, and stock changes. • Domestic food utilization which includes feed, seed, processing, waste, export, and other uses. • Per capita values for the supply of all food commodities (in kilograms per person per year) and the calories, protein, and fat content.

http://faostat.fao.org/	FAOSTAT provides time-series and cross sectional data relating to food and agriculture for some 200 countries.
http://faostat.fao.org/site/291/default.aspx	FAOSTAT "Classic".
http://faostat3.fao.org/faostat-gateway/go/to/home/E	New FAOSTAT (Pilot Version).
http://www.fao.org/economic/ess/ess-capacity/countrystathome/en/	The national version of FAOSTAT, CountrySTAT, is being developed and implemented in a number of target countries, primarily in sub-Saharan Africa. It will offer a two-way data exchange facility between countries and FAO as well as a facility to store data at the national and sub-national levels.
http://www.fao.org/fsnforum/	The Global Forum on Food Security and Nutrition. The FSN Forum is a worldwide community of experts and practitioners on Food Security and Nutrition issues and organizes online discussions to exchange knowledge and to inform the global dialogue and decision-making processes. With over 4500 Members from 170 countries and territories, the FSN Forum allows stakeholders such as academics, researchers, development practitioners, governments and the civil society to actively participate in the debate on topics of the global Food Security and Nutrition agenda and to provide constructive feedback along several policy formulation processes.
http://www.asareca.org/	The Association for Strengthening Agricultural Research in Eastern and Central Africa (ASARECA) is a sub-regional not-for-profit association. It was established in 1994 by ten member countries represented by their national agricultural research for development institutes. The 10 member countries are: Burundi, Democratic Republic of Congo, Eritrea, Ethiopia, Kenya, Madagascar, Rwanda, Sudan, Tanzania, and Uganda. South Sudan joined ASARECA in 2011.
http://www.nepad-caadp.net/	CAADP stands for "Comprehensive Africa Agriculture Development Programme". CAADP is the agricultural programme of the New Partnership for Africa's Development (NEPAD), which in turn is a programme of the African Union (AU). The CAADP pillars are CAADP's four key focus areas for agricultural improvement and investment. They are 'Sustainable Land and Water Management'; 'Market Access'; 'Food Supply and Hunger'; and 'Agricultural Research'.
http://www.cabi.org/	CABI is an inter-governmental, not-for-profit organization that was set up by a United Nations treaty. CABI's mission is to improve people's lives worldwide by providing information and applying scientific expertise to solve problems in agriculture and the environment.
http://www.codesria.org/	The Council for the Development of Social Science Research in Africa (CODESRIA) is headquartered in Dakar, Senegal. It was established in 1973 as an independent pan-African research organization primarily focusing on social sciences research in Africa.
http://www.fara-africa.org/	The Forum for Agricultural Research in Africa (FARA) is an apex organization bringing together and forming coalitions of major stakeholders in agricultural research and development in Africa. It is a strategic platform that fosters continental and global networking to reinforce the capacities of Africa's agricultural science and innovation

	community from research, education/training, extension and civil society engaged in agriculture.
http://www.oecd.org/countries/nigeria/	The Organization for Economic Co-operation and Development (OECD) provides a forum in which governments can work together to share experiences and seek solutions to common problems. OECD works with governments to understand what drives economic, social and environmental change. It measures productivity and global flows of trade and investment, and analyses and compares data to predict future trends. It sets international standards on a wide range of things, from agriculture and tax to the safety of chemicals.

Any enquiries, suggestions, criticisms: dietzaj@ascleiden.nl. Your assistance is welcome!

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